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International Council for the Exploration of the Sea

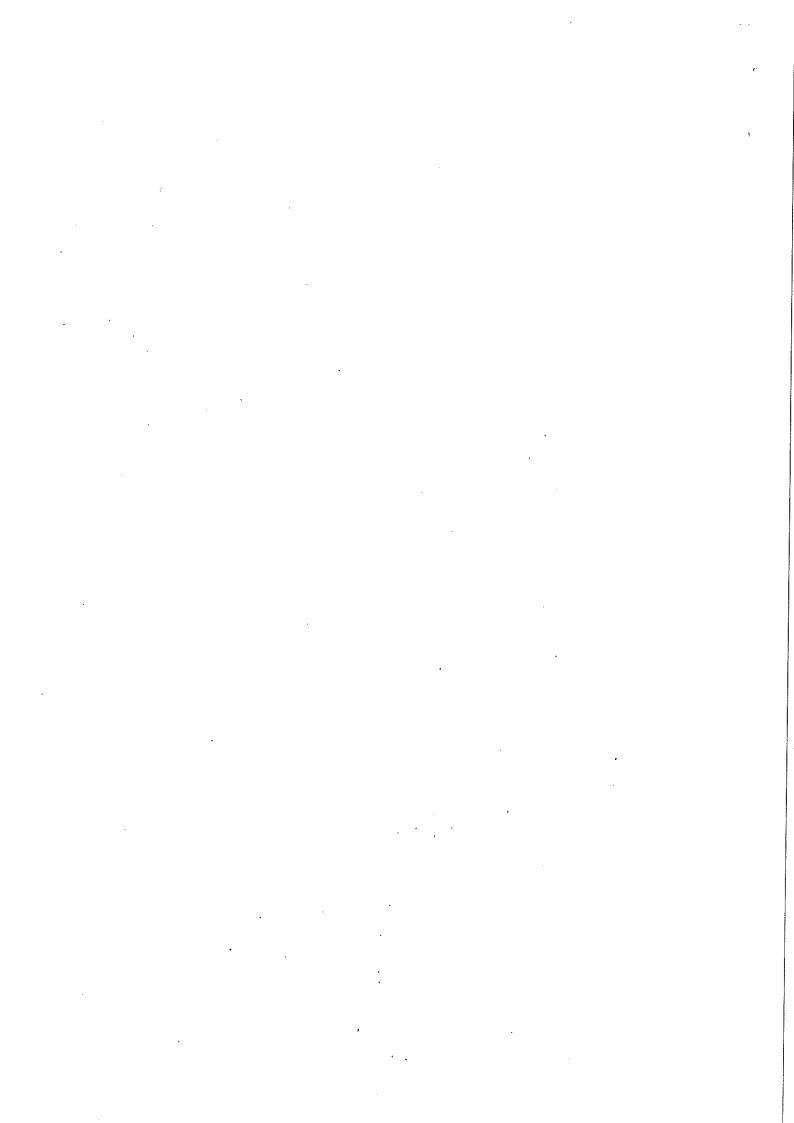
C.M.1989/Assess:5

REPORT OF THE BLUE WHITING ASSESSMENT WORKING GROUP

Copenhagen, 21 - 27 September 1988

This document is a report of a Working Group of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council. Therefore, it should not be quoted without consultation with the General Secretary.

^{*}General Secretary ICES Palægade 2-4 DK-1261 Copenhagen K DENMARK



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1 INTRODUCTION

1.1 Terms of Reference

The Blue Whiting Assessment Working Group (Chairman: Mr T. Monstad) met at ICES Headquarters from 21-27 September 1988 (C.Res.1987/2:3:23) to:

- a) assess the status of and provide catch options for 1989 within safe biological limits for the northern and southern blue whiting stocks;
- b) update the information on zonal distribution of the stock and the fisheries of the northern blue whiting stock.

1.2 Participants

L. Danke German Democratic Republic E. Egorov USSR J.A. Jacobsen Faroe Islands H. Jakupsstovu Faroe Islands B. Kudrin USSR T. Linkowski Poland M. Meixide Spain T. Monstad (Chairman) Norway K.-J. Stæhr (part-time) Denmark

2 STOCK IDENTITY AND STOCK SEPARATION

In previous years, it was assumed that the Porcupine Bank area is a mixing area for the northern stock, southern stock, and local populations (Anon., 1987, 1988).

During the spring 1988 acoustic survey at Porcupine Bank, the USSR and Norwegian scientists did not find any substantial differences which could suggest the existence of two different populations in the area analyzed.

The research of Karasev (1988), who studied blue whiting material from 1974-1986, used the method of parasitological indicators, and confirmed the Zilanov (1984) hypothesis on the population structure of blue whiting and showed the possibility of differentiating a northern and a southern stock on the basis of the infestation by microsporidium Myxobolus aeglefini. According to his results, blue whiting spawning on Porcupine Bank belong to the northern stock.

3 OTOLITH EXCHANGE PROGRAMME

In 1986, the Working Group (Anon., 1987) recommended a third otolith exchange programme to be set up as the results of previous exercises showed very great discrepancies among the readers ageing the same otolith. The idea of this new otolith exchange programme, coordinated by T. Monstad, was to support ageing results by identification of the counted rings on photos. As the programme has just been completed, only preliminary results were available. A working note was made of the results and submitted to the Working Group (Monstad and Linkowski, 1988).

The exchanged material, Sample A from the Norwegian Sea in August and Sample B from Porcupine Bank in March, had 100 otoliths each.

The results supplied by five countries (the Faroes, Iceland, USSR, German Democratic Republic, and Norway) were compared individually and are presented in a matrix for each sample in Table 3.1. Generally the agreement in ageing was highest in Sample B. The overall age composition as well as the mean sample age and percentage agreement reached in the particular age groups were presented in Table 3.2.

High agreement among countries was obtained only for the youngest part of the population, i.e., up to age 4. This explains the high agreement in ageing of Sample B consisting mainly of ages 2-4.

Discrepancy among readers is much higher in ageing of older fish. In Sample A, consisting of 13 age groups but predominantly ages 2-3, the agreement was generally lower. An average of only 27.4% of the older fish (5 years and older) were aged properly, i.e., results overlapped.

The present results, together with results of previous otolith exchange programmes, indicate that ageing of older specimens of blue whiting by traditional methods may be questionable. An attempt to solve this problem in a non-conventional way, i.e., by using objective criteria for age determination, should be made. The Working Group agreed that such an investigation should be initiated by T. Linkowski on the basis of Norwegian otolith samples. The preliminary results should be presented for discussion at the next Working Group meeting.

4 NORTHERN STOCK

4.1 Landings in 1987

Estimates of total landings in 1978-1987 from the various fisheries by countries are given in Tables 4.2-4.5 and summarized in Table 4.1. While most catches in Divisions VIIg-k are taken in the northern part (catches of the USSR, Norway, and the German Democratic Republic), the Working Group decided that from 1984 onwards Divisions VIIg-k as well as Sub-area XII (catches of USSR) should be confined as a whole to the northern stock.

The total landings from all northern blue whiting fisheries in 1987 were estimated at 631,610 t. There was a decrease from 1986 of about 17% in the total landings from the directed fisheries and of about 37% in the landings of the mixed industrial fisheries.

Similarly, as in 1986, some landings from the directed fishery contained by-catch of great silver smelt especially in Division VIa. However, no data for it were available and, therefore, no correction was made. The Working Group considered the by-catch to be at the same level as in 1986, i.e., estimated to be less than 1%.

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4.2 Landings in 1988

Preliminary data on the blue whiting catch in 1988 submitted by Working Group members and by some countries (388,903 t, January-July) are presented in Table 4.6.

4.3 Age Composition of Landings

For the directed fisheries in 1987, age compositions were provided by the Faroes, the German Democratic Republic, Norway, and the USSR. These data together accounted for 96% of the landings of the directed fisheries. Some German Democratic Republic landings from Divisions VIb and VIIg-k were raised to catch in number by age group by USSR data from the same area and month.

For Danish, Dutch, Irish, and UK landings, age compositions of Norwegian landings in the same area and month were used.

Other landings from the directed fisheries were assumed to have the same relative age compositions as the total sampled part. The age composition of the catches in the directed fisheries is given in Table 4.7.

For landings of blue whiting taken in the mixed industrial fisheries in the North Sea (Divisions IVa and IIIa), data were available for Norwegian catches only. These accounted for 42% of the total landings. Landings from other countries in these areas were assumed to have the same age compositions as the Norwegian landings in the same area and months (Table 4.8). In a new mixed industrial fishery in Division Vb, blue whiting landings by Faroese vessels were raised to catch in number by age group from Faroese samples. These landings are included in Table 4.8.

The raised age compositions for the directed fisheries were assumed to give the total age composition in the northern area (Table 4.9).

4.4 Weight at Age

Mean weight-at-age data for 1987 were presented by the Faroe Islands, the German Democratic Republic, Norway, and USSR. Landings from other countries were assumed to have the same mean weight at age when fished in the same area and period as the sampled part. Weighted mean weights were calculated and were weighted by the total landings in numbers in each fishery. The total catch landed in 1987 was compared to the sum of products (SOP) of the total numbers landed in 1987 and mean weight at age. The calculated SOP was within 1% of the nominal landings. The mean weights at age used in the VPA runs are shown in Table 4.10.

4.5 Stock Estimates

4.5.1 Acoustic surveys in 1988

4.5.1.1 Surveys in the spawning season

During the spawning season of 1988, USSR and Norway carried out acoustic surveys in the area west of the British Isles to assess the size of the blue whiting spawning stock (Belikov et al.,1988; Monstad, 1988a).

The USSR, which surveyed the area twice, made the first coverage in the period 4-27 March from north to south along the continental shelf edge from the Faroes/Shetland Channel to south of Ireland, i.e., between 49 and 62 N. The total biomass observed was estimated at 2.0 million t, corresponding to 14.3 x 10 individuals, including a spawning stock of 1.9 million t or 11.7 x 10 individuals (Figure 4.1). The second coverage was carried out in the period 28 March - 21 April from south to north between 52 and 60 N, extending westwards to approximately 16 W. It was made concurrently with an ichthyoplankton survey. The biomass of blue whiting observed during the second coverage was estimated at 3.7 million t or 31.2 x 10 individuals (Figure 4.2). Of this amount, 3.1 million t or 29.9 x 10 individuals belonged to the spawning stock.

In the area south of Ireland, blue whiting were observed to start spawning on 20-25 February, and massive spawning occurred west of Ireland during the first and second decades of March. In the area west of the Hebrides and in the Rockall Bank area, spawning lasted until the second half of April.

The distribution of larval blue whiting (Figure 4.3) corresponded to the pattern observed in previous years, but larvae were found to be more abundant than in 1987.

The Norwegian survey took place from 25 March - 24 April and was carried out in a south-north direction from south of Porcupine Bank to the Faroe/Shetland area, i.e., between 51° and 62° N, extending westwards to the Rockall Bank area. The blue whiting stock observed (Figure 4.4) was estimated at 7.1 million t or 63_{\circ} 7 x 10 individuals. Of this amount, 6.8 million t or 58.4 x 10 individuals belonged to the spawning stock.

The length and age compositions are given in Figure 4.5 for the three various surveys. This shows that the 1983 year class was found to predominate (32% of the total) both the Norwegian survey and the second USSR survey. The 1986 year class was also found in notable numbers, mainly within the Faroe/Shetland area.

4.5.1.2 Surveys in the feeding season

Four countries carried out acoustic surveys in the Norwegian Sea during the summer of 1988 to, among other things, estimate blue whiting distribution and abundance. Working notes and information on the results were submitted to the Working Group. The cruise tracks are shown in Figure 6.1A, and the area where blue whiting were observed is shown in Figure 6.1B.

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From 18 July - 21 August, a Norwegian research vessel surveyed the area from the North Sea to northern Norway, extending westwards to the area between the Faroes and Iceland. In addition, information of blue whiting was also obtained from another Norwegian research vessel aiming at other objectives in the Jan Mayen area.

Blue whiting were observed over greater parts of the area surveyed, but the recordings, mostly found between 200 and 400 m depth, were very scattered. Consequently, the estimate was also very low and was considered an underestimate. Length and age compositions are shown in Figure 4.6. The 1987 year class was found in greatest numbers, while the 1983 year class gave the highest contribution to the biomass observed (Monstad, 1988b).

From 26 July - 19 August, the USSR carried out an acoustic survey in the Norwegian Sea within the area 62^0-69^0 N and 10^0-5^0 W. Only scattered recordings of blue whiting were made, with an estimate of a corresponding low figure, also considered an underestimate. Length and age compositions of blue whiting are given in Figure 4.7. The 1983 year class was found in highest numbers, followed by the 1986 year class (Kudrin, pers. comm.).

The Faroe Islands carried out an acoustic survey in the area north of the Faroes between $62^{\circ}-66^{\circ}$ N and $13^{\circ}-4^{\circ}$ W. Blue whiting were recorded in most of the area surveyed except in the north-western part. However, the recordings were generally very low, with the highest concentration on the warmer side of the polar front (Jacobsen, 1988).

Iceland also aimed for blue whiting while conducting their annual 0-group fish survey along the Icelandic coast during August. The area between $63^{\circ}-68^{\circ}$ N and from 10° W to the Greenland coast was surveyed (Figure 6.1), but no blue whiting were observed (Vilhjalmsson, pers. comm.).

4.5.1.3 Discussion

In the period when the acoustic surveys were conducted during spring 1988, the weather conditions were very favourable, enabling the vessels to obtain recordings without acoustic disturbances. The stock was distributed along the continental shelf west of the British Isles and also more westwards than usual over deep sea areas.

The three estimates obtained are listed in the text table below (in millions of t) together with the estimates from the spawning area since 1981. The spawning stock is given in brackets:

Year	Estimates				
1981	6.1(5.4)				
1982	2.5				
1983	4.7(4.4), 3.6(3.5)				
1984	2.7(2.4), 3.4(2.7), 2.8(2.1), 2.4(2.2)				
1985	6.4(5.6), 2.6(2.0)				
1986	6.4(5.6), 2.6(2.0)				
1987	$5.4(5.1), 7.4(6.9), 4.8(4.5)^{1}$				
1988	2.0(1.9), 3.9(3.1), 7.1(6.8)				

¹ Includes some southern blue whiting.

The first USSR survey (2.0 million t) was considered an underestimate due to the area of coverage being only along the shelf edge. The second USSR survey (3.9 million t), being more westward, included also the part of the stock distributed over deeper water and was, therefore, considered to be more accurate.

The Norwegian survey, also covering the area westwards from the shelf and more to the north than the second USSR survey, measured the biomass at 7.1 million t. However, due to the possibility of having recorded some of the fish concentrations more than one time while surveying in a south-north direction at the same time as post-spawners migrated northwards, this estimate was considered an overestimate. On the other hand, the second USSR survey was also in a south-north direction and took place at the same time.

The two countries' age compositions of blue whiting from the spawning were found to be similar (Figure 4.5). The 1982 year class was observed by both countries to contribute about 15% to the stock, while the 1983 year class predominated with two times that contribution.

The Norwegian surveys in August 1988 all obtained weak recordings of blue whiting, and the respective estimates were considered to be underestimates. In 1985, the Norwegian Sea Survey Workshop discussed in detail various estimates obtained during the feeding season of several years. It was then concluded that one of the main problems for not recording the total stock properly was the vessels' threshold effect (Anon., 1985; Anon., 1987). Due to the present methodology, the Working Group concluded in 1986 that such surveys could not give estimates of the total stock when dispersed over wide areas and great depths. Therefore, the ICEScoordinated acoustic survey, conducted every summer since 1982, did not take place in 1987.

However, NEAFC asked ICES to provide information on zonal distribution of the northern blue whiting stock updated for 1988. The Working Group, therefore, recommended that surveys in the Norwegian Sea should take place on a national basis, and that the results should be brought to the meeting for discussion. This was done, and from the discussion, it was concluded that it was not possible to present any reliable estimate of the total stock size from the summer surveys of 1988, and hence no updating of the biomass in economic zones. The overall geographic distribution observed, however, is presented in Figure 6.1.

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The Norwegian surveys in August 1988 all obtained weak recordings of blue whiting, and the respective estimates were considered to be underestimates. In 1985, the Norwegian Sea Survey Workshop discussed in detail various estimates obtained during the feeding season of several years. It was then concluded that one of the main problems for not recording the total stock properly was the vessels' threshold effect (Anon., 1985; Anon., 1987). Due to the present methodology, the Working Group concluded in 1986 that such surveys could not give estimates of the total stock when dispersed over wide areas and great depths. Therefore, the ICEScoordinated acoustic survey, conducted every summer since 1982, did not take place in 1987.

However, NEAFC asked ICES to provide information on zonal distribution of the northern blue whiting stock updated for 1988. The Working Group, therefore, recommended that surveys in the Norwegian Sea should take place on a national basis, and that the results should be brought to the meeting for discussion. This was done, and from the discussion, it was concluded that it was not possible to present any reliable estimate of the total stock size from the summer surveys of 1988, and hence no updating of the biomass in economic zones. The overall geographic distribution observed, however, is presented in Figure 6.1.

The length and age composition of blue whiting in the Norwegian Sea, however, differs between USSR and Norwegian observations (Figures 4.6 and 4.7). Norway, however, surveyed a larger area than the USSR which explains some of the difference in the total results. The most notable difference is the observation of the 1982 year class which the USSR found to contribute approximately 15% to the stock, while Norway only found approximately 5% of it. This again indicates a problem which most probably is an ageing problem, discussed in Section 3, but which could also be differences in the sampling technique.

4.5.2 Virtual population analysis (VPA)

4.5.2.1 Tuning the VPA to survey results

It was decided by the Working Group to use the tuning module of the ICES VPA program to obtain initial VPA results. The age range chosen for tuning was 3-14 years, and data from 1982-1987 were (Table 4.11). The only data set covering the entire period is the USSR acoustic surveys of the spawning stock at the spawning area west of the British Isles during the spawning period. For the Norwegian surveys, data were available for the 1982-1986 and 1988. For the tuning, the 1987 data were assumed to be the average for 1986 and 1988 for the same year The Norwegian surveys of the spawning stock at the spawning area were not conducted in 1982 and 1985, and for these years, the data similarly were assumed to be the average of the two neighbouring years. The USSR CPUE data for July were not available for 1982 and 1987, and for those years, data from August for the USSR and German Democratic Republic trawlers combined were used.

The results of the analysis are presented in Tables 4.12-4.14 and in Figure 4.8.

4.5.2.2 Estimation of fishing mortality using separable VPA

From the F values given in Table 4.11, it was decided to use F=0.25 at age 7 and a selection factor of S=1.0 as input to the separable VPA. It should be noted that all the years 1978-1987 have been given the same weight in the analysis. The matrix of residuals (Table 4.15) does not show any large residuals or pattern in the residuals which would suggest rejection of the results.

4.5.2.3 Virtual population analysis

The option of the program to use the final population of the separable VPA as input to an ordinary VPA was chosen. The results are given in Tables 4.16 and 4.17 and in Figure 4.9.

4.5.2.4 Discussion of the stock size estimates

For a number of years, the Working Group has calibrated the VPA to the results from the acoustic assessments of the spawning stock during the spawning period using repetitive VPA runs. This procedure has been commented on by the ACFM, and suggestions have

been made to the Working Group to use both the separable VPA method and the tuning method.

The results of this exercise presented above indicate a spawning stock at 1 January 1987 which is very close to the lower estimate obtained during the spawning surveys in 1987 back-calculated to 1 January 1987. Furthermore, the spawning stock size estimates obtained from the VPA reflect, with few exceptions, very closely the acoustic survey results obtained in previous years and also in 1988, as shown in the text table below.

Estimate	1983	1984	1985	1986	1987	1988
Survey VPA	3.6-4.4 2.6	2.2-2.7	4.1 3.5	2.0-5.6	4.1-5.1	3.1-6.8

Biomass in millions of t.

Based on this, the Working Group resolved that the stock size estimate obtained from the VPA gave a realistic picture of the present situation, and that it could be used for prediction of the future catch levels.

4.5.2.5 VPA results (Tables 4.16 and 4.17)

The VPA results show that the total biomass decreased steadily from 1978 to 1982. From 1983 onwards, an increase is again observed, which was an effect of the strong incoming 1982 and 1983 year classes. The spawning stock biomass shows a similar picture. However, the declining trend reversed only in 1985 when the two strong year classes started to contribute to the spawning stock. At the beginning of 1988, the total stock biomass and the spawning stock biomass were at a level of 5.8 and 4.3 million t, respectively.

The average fishing mortality on ages 4-8 increased steadily from 1978-1981 when a level of 0.27 was reached. Since then, the average fishing mortality has fluctuated between 0.18 and 0.30.

4.5.2.6 Yield per recruit

Yield per recruit and spawning stock per recruit have been calculated using the data given in Table 4.18 and are shown in Figure 4.9. As there are no clear indications of the strength of the incoming year classes, the exploitation pattern chosen for ages 0-2 is the 1978-1985 average. For ages 3-15+, the exploitation pattern estimated by the separable VPA was chosen, with the F values scaled so that the mean F at ages 4-8 corresponded to the 1987 level. $F_{\rm max}$ corresponds to F = 0.55 which is very close to the $F_{\rm max}$ calculated in 1987. $F_{\rm O}$ equals 0.17, which is slightly lower than the average F on ages 4-8.

The yield-per-recruit calculations onm blue whiting are very sensitive to the exploitation pattern on the younger age groups (0-2) due to the high growth rate in the first years.

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The yield-per-recruit calculations onm blue whiting are very sensitive to the exploitation pattern on the younger age groups (0-2) due to the high growth rate in the first years.

4.5.3 Catch per unit effort

Data on catch per unit effort from the directed fisheries in 1987 were submitted by the German Democratic Republic, Norway, and the USSR. These countries presented their data broken down by vessel tonnage class, area, and month.

Comparable time series of CPUE data for Divisions IIa, IVa, Vb, VIa,b, VIIb-c, and VIIg-k which could be indicative of changes in stock abundance are compiled in Tables 4.19 and 4.20 and Figure 4.10.

In Division IIa, the blue whiting fishing season in 1987 again was prolonged compared with the years 1983-1985. The mean CPUE of the USSR vessels as a whole decreased slightly from 1984 to 1987. The CPUE of the German Democratic Republic vessels decreased distinctly in 1987, mainly due to a relatively small fleet fishing in Division IIa.

From 1983 onwards, Poland has not taken part in the blue whiting fishery, and from 1981, Iceland has not presented data. Their earlier data are given in the 1987 Working Group report (Anon., 1988).

In Division Vb, the CPUE decreased for all countries which reported, with the exception of summer catches by USSR vessels (2,000-3,999 GRT) for which the constant increase in CPUE in July-August since 1982 also continued in 1987.

The data from the spawning fishery (Divisions VIa,b, VIIb,c, and VIIg-k) are difficult to interpret. Noticeable are the high values for Norwegian vessels in Divisions VIIg-k, whereas the CPUE of German Democratic Republic and USSR vessels in the same area declined in 1987 compared to 1986. In Divisions VIIb,c, the CPUE of the smaller Norwegian ships decreased since 1984; in comparison, the USSR (2,000-3,999 GRT) CPUE increased from 1986 to 1987.

The Working Group recognized the difficulties in interpretation of CPUE data as a sign for stock variation. The decrease in total catch in most divisions, an increase in some of them, and the variable year-to-year differences in CPUE among countries underlines the difficulties in obtaining a clear picture of stock variations from the data.

The Working Group, however, used the only long-term series of CPUE of large vessels (2,000-3,999 GRT) for July 1983-1986 to tune the VPA. The Working Group considers it important to continue the exchange of CPUE data.

4.6 Catch Projections and Management Considerations

A projection of catches in 1989 and resulting total and spawning stock biomass in 1990 was made using the stock size estimates at the beginning of 1988 and the parameters given in Table 4.21. In the projections, a recruitment equal to the 1978-1985 average, excluding the strong year classes of 1982 and 1983, of 11,000 million at age 0 was used for the 1986-1990 year classes.

It was assumed that the catch in 1988 would be about 600,000 t, corresponding to F = 0.17 for ages 4-8. The results of the catch projections are given in Tables 4.22 and 4.23 and shown in Figure 4.9. It can be seen that a continuation of the assumed 1988 F level would result in a catch of 631,000 t in 1989, whereas fishing at the 1987 F level would result in a catch of 780,000 t in 1989.

In Figure 4.11 is given a plot of recruitment versus spawning stock biomass from 1977, when the blue whiting fishery was at full exploitation, to 1987. F_{med} , F_{high} , and F_{low} are estimated and shown in the figure. The number of points, however, are rather few and dispersed, and the picture does not illustrate any trend in this relationship.

5 SOUTHERN STOCK

5.1 Landings

Total landings from the southern area are given in Table 5.1. The Spanish landings decreased in 1987 by 5% and the Portuguese landings increased by 18%.

5.2 Catch Composition

Table 5.2 provides the length composition of blue whiting from the Spanish and Portuguese fisheries in the years 1983-1987.

5.3 Age Composition of Landings

Data on age composition were available for the Spanish landings in 1981 and 1987. The Portuguese catch in numbers by length group in these years was converted to catch in numbers by age group using Spanish age/length keys. The results are presented in Table 5.3.

5.4 Weight at Age

Mean weight-at-age data for 1981-1987 were calculated for the landings from the Spanish and Portuguese fisheries (Table 5.4). The total catch landed was compared to the sum of products (SOP) of total numbers landed and mean weight at age. The calculated SOP discrepancy was 1.3% in 1981 and 0% in 1987 of the nominal landings.

5.5 Catch per Unit Effort

CPUE data for the main Galician ports in the period 1977-1987 are presented in Table 5.5 and in Figure 5.1. CPUE data for the period 1983-1987 for single and pair trawlers separately are also presented in Table 5.6 and in Figure 5.1. The effort in 1987 was at the same level as that in 1986 for both single and pair trawlers. In the period 1983-1986, effort increased in the pair trawlers and decreased in the single trawlers.

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5.6 Age at Maturity

Last year, a maturity/age ogive was used with values calculated from the maturity/length ogive reported by Ehrich and Robles (1982) using the growth parameters K=0.136 and L=33.3. In 1988, a maturity ogive showing 18, 48, 91, 98, and 100% maturity at ages 1-6, respectively, was presented to the Working Group. These values were calculated with the maturity and age data of a sample of n=277 collected in a Spanish bottom trawl survey during the spawning season in March 1987. This maturity ogive was considered more appropriate and was used for the assessment for the entire period.

5.7 <u>Virtual Population Analysis (VPA)</u>

The tuning method was applied to provide a preliminary estimate of terminal F values. Unfortunately, fleet data disaggregated by age group were only available for the CPUE of the Spanish trawlers in the period 1981-1987 (Table 5.7). The final F values of the tuning module were used to carry out a separable VPA, with terminal F = 0.72 at age 2 and terminal S = 1 (Table 5.8). The fishing mortalities obtained were used in the final VPA run (Tables 5.9 and 5.10). In last year's VPA run, some increase in the biomass in 1985 was observed. It was also shown in the CPUE data of the Spanish trawlers (Figure 5.1) and the biomass indices of the Spanish and Portuguese bottom trawl surveys. However, does not show any increase in the 1985 biomass. The reason could be that the 1982, 1983, and 1984 year classes contributed 75% to the catch in numbers in 1985 and 1986, respectively, but only 15% in 1987. The catch-at-age data of the Spanish and Portuguese trawlers which covered the continental shelf area, where the youngest age groups are distributed, did not give any information on the older year classes which are distributed in deeper waters and in the shelf edge area.

5.8 Assessment

The VPA was run using seven years of data. No acoustic surveys were carried out covering all the area in which the southern blue whiting stock is distributed. The VPA results show that the total biomass decreased in the years 1984-1986 and increased in 1987. The spawning stock biomass decreased in the period 1981-1987. Acoustic surveys to provide stock size estimates and investigations on stock separation and migration are needed. This is because the F values may be too high due to a migration of the older individuals out of the fishing area. It is not possible to make a reliable analytical assessment without more supporting information.

6 ZONAL DISTRIBUTION OF BLUE WHITING

The four hydroacoustic surveys which took place in the Norwegian Sea during the summer of 1988 did not obtain any reliable estimates of the total stock size (see Section 4.5.1.3). Therefore, the acoustic estimates of the northern stock divided into areas within and beyond areas of national fisheries jurisdiction of

NEAFC member countries could not be updated. The overall geographical distribution obtained and the various survey cruise tracks are shown in Figure 6.1.

The total landings of blue whiting from 1978-1987 are divided into national fishery zones in Table 6.1. The table was derived from data brought to the meeting by Working Group members, and some assumptions had to be made. For this reason, the totals for each year deviate somewhat from the official totals.

The fishery zone of Jan Mayen was not declared until 1981, and an unknown part of the catches allocated to international waters in the years prior to 1981 was actually taken in this zone.

7 RESEARCH RECOMMENDATIONS

- a) The results of surveys and investigations have provided evidence of a separate southern stock. In order to assess and manage the southern stock, data series on age composition of landings are required, and acoustic surveys are needed. The Working Group recommends that more surveys be done to investigate the total distribution area for the southern stock.
- b) The Working Group considers it very important that the northern blue whiting stock is monitored each year. The surveys of the spawning stock during the spring have proved to be very valuable and the Working Group recommends that they be continued with coordination between research vessels during the surveys in the sea.
- c) Although it is difficult at present to indicate the precision of the stock estimates obtained by the acoustic surveys in the Norwegian Sea, the results from the 1981-1987 surveys have given appreciable information, especially about the younger year classes of the blue whiting stock. The Working Group, therefore, recommends that acoustic surveys during the summer/autumn season of 1989 should be carried out on a national basis.
- d) The Working Group recommends that the countries deliver the CPUE and survey data for the southern area into age groups in number per hour to be used for tuning the VPA.
- e) As pointed out by ACFM, the difference in the range of ages in the catch between the northern (ages 0-15) and southern stocks (ages 0-8) may be due to ageing problems, because the length compositions are similar. The Working Group recommends an otolith exchange between the southern and northern areas.
- f) As in 1986, NEAFC adopted a recommendation to use 35-mm mesh size in directed blue whiting fisheries, which is expected to have a positive influence on stock size. The Working Group recommends that further investigations should be carried out on selectivity of blue whiting using mesh sizes used in the mixed industrial fisheries and in the directed fisheries in the northern area.

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g) Due to great discrepancies in ageing of older blue whiting specimens (ages 5 and older) the Working Group recommends that attempts be initiated to solve this problem in a non-conventional way, e.g., by using objective criteria for age determination.

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Table 3.1 Agreement in ageing between countries (in percent).

Country	Faroes	German Dem. Republic	Iceland	Norway
Sample A:				
USSR	64	44	68	69
Norway	73	50	74	x
Iceland	69	51	x	
Ger.Dem.Rep.	53	x		
Sample B:				
USSR	88	86	89	90
Norway	94	87	87	X
Iceland	91	85	×	Α,
Ger.Dem.Rep.	84	X	••	

g) Due to great discrepancies in ageing of older blue whiting specimens (ages 5 and older) the Working Group recommends that attempts be initiated to solve this problem in a non-conventional way, e.g., by using objective criteria for age determination.

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Table 3.1 Agreement in ageing between countries (in percent).

Country	Faroes	German Dem. Republic	Iceland	Norway
Sample A:		-		
USSR	64	44	68	69
Norway	73	50	74	x
Iceland	69	51	x	••
Ger.Dem.Rep.	53	x		
Sample B:				
USSR	88	86	89	90
Norway	94	87	87	×
Iceland	91	85	x	
Ger.Dem.Rep.	84	x		

Table 3.2 Age composition obtained by countries.

Age	Countries					Overlapping of results (in %)	
	Faroes	Ger. Dem. Republic	Iceland	Norway	USSR	Mean	Range
Sample A:							
1 2	7	~ ~	8	9	8	71.4	0-100
3	34 34	24 50	38	39	34	75.2	38-97
4	4	30 8	28 5	28	26		46-93
5 and older	-	18	21	3 21	9 23	60.1 27.4	0-100 13-43
Sample mean							
age	3.77	3.77	3.29	3.54	3.79	_	-
Sample B:				• · · · · · · · · · · · · · · · · · · ·			
1	3	3	3	3	3	100	_
2	11	11	13	11	10	85.9	76-100
3	70	82	69	73	72	92.3	83-99
4	15	3	14	11	14	70.0	18-100
5	-	-	-	1	_		-
Sample mean				<u></u>			
age	2.98	2.86	2.95	2.96	2.98	_	-

Table 4.1 Landings (tonnes) of BLUE WHITING from the main fisheries, 1978-1987.

Area	1978	1979	1980	1981	1982
Norwegian Sea fishery (Sub-areas I + II and				· · · · · · · · · · · · · · · · · · ·	
Divisions Va, XIVa + XIVb)	236,226	741,042	766,798	520,738	110,68
Fishery in the spawning area (Divisions Vb, VIa,					
VIb and VIIb + VIIc)	229,228	284,547	250,693	288,316	316,56
Icelandic industrial fishery (Division Va)	9,484	2,500	-	-	
Industrial mixed fishery					
(Divisions IVa-c, Vb, IIIa)	99,874	63,333	75,129	61,754	117,578
Subtotal northern fishery	574,812	1,091,422	1,092,620	870,808	589,919
Southern fishery (Sub-areas VIII + IX,					
Divisions VIId,e + VIIg-k)	33,898	27,176	29,944	38,748	31,590
Total	608,710	1,118,598	1,122,564	909,556	621,509
Area	1983	1984	1985	1986	1987 ¹
lorwegian Sea fishery Sub-areas I + II and	F0 064	£2. 400			
Divisions Va, XIVa + XIVb)	52,961	65,932	90,742	160,061	123,042
ishery in the spawning rea (Divisions Vb, VIa, Tb and VIIb + VIIc)	361,537	421,865 ²	464,263 ²	534,253 ²	445,879 ²
celandic industrial ishery (Division Va)	7,000	-	-		-
ndustrial mixed fishery Divisions IVa-c,Vb,IIIa)	117,737	122,806	97,769	99,580	62,689
ubtotal northern fishery	539,235	604,678	644,899	757,370	631,610
outhern fishery Sub-areas VIII + IX,				÷	· · ·
ivisions VIId,e + VIIg-k)	30,835	31,173 ³	42,817	33,081 ³	32,796 ³
otal	570,070	635,851	687,716	790,451	664,406
Preliminary			*		

Preliminary.

2 Including directed fishery also in Divisions VIIg-k and Sub-area XII.

3 Excluding directed fishery also in Divisions VIIg-k.

Table 3.2 Age composition obtained by countries.

Age		Co	untries				apping of ts (in %)
Ayc	Faroes	Ger. Dem. Republic	Iceland	Norway	USSR	Mean	Range
Sample A:	-						
1	7		8	9	8	71.4	0-100
2	34	24	38	39	34	75.2	38-97
3	34	50	28	28	26	74.4	46-93
4	4	8	5	3	9	60.1	0-100
5 and older	21	18	21	21	23	27.4	13-43
Sample mean							
age	3.77	3.77	3.29	3.54	3.79	-	-
<u>Sample B</u> :							-
1	3	3	3	3	3	100	_
2	11	11	13	11	10	85.9	76-100
3	70	82	69	73	72	92.3	83-99
4	15	3	14	11	14	70.0	18-100
5	-		_	1	-	-	-
Sample mean		 					
age	2.98	2.86	2.95	2.96	2.98	-	

Table 4.1 Landings (tonnes) of BLUE WHITING from the main fisheries, 1978-1987.

Area	1978	1979	1980	1981	1982
Norwegian Sea fishery (Sub-areas I + II and					
Divisions Va, XIVa + XIVb)	236,226	741,042	766,798	520,738	110,68
Fishery in the spawning area (Divisions Vb, VIa, VIb and VIIb + VIIc)	229,228	204 547	250 600	000 04	
	223,220	284,547	250,693	288,316	316,56
Icelandic industrial fishery (Division Va)	9,484	2,500	-	-	
Industrial mixed fishery	•				
(Divisions IVa-c, Vb, IIIa)	99,874	63,333	75,129	61,754	117,578
Subtotal northern fishery	574,812	1,091,422	1,092,620	870,808	589,919
Southern fishery (Sub-areas VIII + IX,					
Divisions VIId,e + VIIg-k)	33,898	27,176	29,944	38,748	31,590
Cotal	608,710	1,118,598	1,122,564	909,556	621,509
					······································
irea	1983	1984	1985	1986	19871
orwegian Sea fishery Sub-areas I + II and ivisions Va, XIVa + XIVb)	52,961	65,932	90,742	160,061	123,042
ishery in the spawning					·
rea (Divisions Vb, VIa, Ib and VIIb + VIIc)	361,537	421,865 ²	464,263 ²	534,253 ²	445,879
celandic industrial ishery (Division Va)	7,000	-	-	-	••
ndustrial mixed fishery Divisions IVa-c,Vb,IIIa)	117,737	122,806	97,769	99,580	62,689
btotal northern fishery	539,235	604,678	644,899	757,370	631,610
outhern fishery Sub-areas VIII + IX,					·
	30,835	31, 173 ³	42 8173	33,081 ³	32 7063
.visions VIId,e + VIIg-k)	201022	0.11.10	14/01/	00,001	34,130

Preliminary.

Including directed fishery also in Divisions VIIg-k and Sub-area XII.

Excluding directed fishery also in Divisions VIIg-k.

Table 4.2 Landings (tonnes) of BLUE WHITING from the Norwegian Sea (Sub-areas I and II, Divisions Va, XIVa and XIVb) fisheries, 1978-1987, as estimated by the Working Group.

1978	1979	1980	1981	1982
→	-		-	473
2,810	762	-	11,131	-
-	-	-	5,093	2,067
7,301	22,502	14,234	15,607	3,042
8,421	1,157	8,919	17,385	890
· -		· -	` -	-
17,756	12,428	4,562	4,808	-
· -	33,588 ³	902	187	
5,083	4,346	11,307	2,434	443
11	· _	· _	. –	_
194,844	666,259	726,874	464,093	103,770
236,226	741,042	766,798	520,738	110,685
	2,810 7,301 8,421 17,756 5,083 11 194,844	2,810 762 7,301 22,502 8,421 1,157 17,756 12,428 - 33,588 5,083 4,346 11 - 194,844 666,259	2,810 762 - 7,301 22,502 14,234 8,421 1,157 8,919 - 17,756 12,428 4,562 - 33,588 902 5,083 4,346 11,307 11 - 194,844 666,259 726,874	2,810 762 - 11,131 5,093 7,301 22,502 14,234 15,607 8,421 1,157 8,919 17,385

Country	1983	1984	1985	1986	1987 ¹
Denmark		93	-	-	
Faroes	11,316	-	_	-	9,290
France	2,890	₩		_	_
German Dem.Rep.	5,553	8,193	1,689	3,541	1,010
Germany, Fed.Rep.	2	35	75	106	· -
Greenland	→	_	-	10	_
Iceland	-	105		-	_
Norway	5,061	689	_	_	_
Poland	· —	-		-	56
UK (Engl.& Wales)		-	-	_	_
USSR	28,141	56,817	88,978	156,404	112,686
Total	52,961	65,932	90,742	160,061	123,042

Preliminary.

Including catches off East Greenland (Division XIVb) (698 t in 1978, 204 t in 1979, and 8,757 t in 1980).

Including purse seine catches of 29,162 t of juvenile blue

Table 4.3 Landings (tonnes) of BLUE WHITING from directed fisheries in the spawning area (Divisions Vb, VIa,b, VIIb,c and since 1984 Divisions VIIg-k and Sub-area XII), 1978-1987, as estimated by the Working Group.

Country	1978	1979	1980	1981	1982
Denmark	23,498	21,200	19,272	11,361	23,164
Faroes	39,491	35,780	37,488	23,107	38,958
France	· —	-		207.07	1,212
German Dem.Rep.	1,714	172	181	6,562	7.771
Germany, Fed.Rep.	6,363	3,304	709	935	701
Iceland	7,537	4,864	5,375	10,213	1,689
Ireland	· <u>-</u>	_	-	.0,2.0	.,,,,,
Netherlands	1,172	154	-	222	200
Norway	116,815	186,737	133,754	166,168	169,700
Poland	2,469	4,643	_	2,279	.05,.00
Spain	14	-	-	-, -, -	_
Sweden	6,260	-	3,185	_	_
UK (Engl.& Wales)	5,287	4,136	3,878	6,000	
UK (Scotland)	1,599	1,466	6,819	2,611	-
USSR	17,009	22,091	40,032	58,858	73,171
Total	229,228	284,547	250,693	288,316	316,566

Country	1983	1984	1985	1986	1987 ¹
Denmark	28,680	26,445	21,104	11,364	2,655
Faroes	56,168	62,264	72,316	80,564	70,625
France	3,600	3,882		-	70,023
German Dem.Rep.	3,284	1,171	6,839	2,750	3,584
Germany, Fed. Rep.	825	994	626	2,750	266
Iceland	1,176		-	-	200
Ireland	·	_	668	16,440	3,300
Netherlands	150	1,000	1,801	8,888	
Norway	185,646	211,773		283, 162 ²	191,012
Poland	· _		-	2007102	131,012
Spain	318	-	_	_	_
Sweden	-	-		_	
UK (Engl.& Wales)	-	33	_	_	3
UK (Scotland)	_	_		3,472	3,310
USSR	81,690	114,303	126,772	$127,613^3$	165,497
Total	361,537	421,865	464,263	534,253	445,879

Table 4.4 Landings (t) of BLUE WHITING from the Icelandic mixed industrial trawl fisheries in Division Va, 1978-1987.

Country	1978	1979	1980	.1981	1982	1983	1984	1985	1986	1987
Iceland	9,484	2,500	-	-	-	7,000	_	_		-

Preliminary.

2 Including directed fishery also in Division IVa.

Table 4.2 Landings (tonnes) of BLUE WHITING from the Norwegian Sea (Sub-areas I and II, Divisions Va, XIVa and XIVb) fisheries, 1978-1987, as estimated by the Working Group.

Country	1978	1979	1980	1981	1982
Denmark		-	_	-	473
Faroes	2,810	762	_	11,131	=
France	_		-	5,093	2,067
German Dem.Rep.	7,301	22,502	14,234	15,607	3,042
Germany, Fed.Rep.2	8,421	1,157	8,919	17,385	890
Greenland	_	_	-	-	-
Iceland	17,756	12,428	4,562	4,808	_
Norway	· -	33,588 ³	902	187	-
Poland	5,083	4,346	11,307	2,434	443
UK (Engl.& Wales)	11	_	· -	_	-
USSR	194,844	666,259	726,874	464,093	103,770
Total	236,226	741,042	766,798	520,738	110,685

Country	1983	1984	1985	1986	1987 ¹
Denmark	-	93	-	-	-
Faroes	11,316	_	_	-	9,290
France	2,890	→	-	_	· -
German Dem.Rep.	5,553	8,193	1,689	3,541	1,010
Germany, Fed.Rep. 2	. 2	35	75	106	_
Greenland	-	-	-	10	
Iceland	_	105	-	-	
Norway	5,061	689	-	-	_
Poland	· -	_	-	-	56
UK (Engl.& Wales)			-	_	-
USSR	28,141	56,817	88,978	156,404	112,686
Total	52,961	65,932	90,742	160,061	123,042

Preliminary.

Including catches off East Greenland (Division XIVb) (698 t in 1978, 204 t in 1979, and 8,757 t in 1980).

Including purse seine catches of 29,162 t of juvenile blue

Table 4.3 Landings (tonnes) of BLUE WHITING from directed fisheries in the spawning area (Divisions Vb, VIa,b, VIIb,c and since 1984 Divisions VIIg-k and Sub-area XII), 1978-1987, as estimated by the Working Group.

Country	1978	1979	1980	1981	1982
Denmark	23,498	21,200	19,272	11,361	23,164
Faroes	39,491	35,780	37,488	23,107	38,958
France	· -	· _	-	==,	1,212
German Dem.Rep.	1,714	172	181	6,562	7,771
Germany, Fed.Rep.	6,363	3,304	709	935	701
Iceland	7,537	4,864	5,375	10,213	1,689
Ireland	_			_	-
Netherlands	1,172	154	_	222	200
Norway	116,815	186,737	133,754	166,168	169,700
Poland	2,469	4,643	· -	2,279	
Spain	14	-	_	_	_
Sweden	6,260	-	3,185	-	-
UK (Engl.& Wales)	5,287	4,136	3,878	6,000	-
UK (Scotland)	1,599	1,466	6,819	2.611	
USSR	17,009	22,091	40,032	58,858	73,171
Total	229,228	284,547	250,693	288,316	316,566

Country	1983	1984	1985	1986	1987 ¹
Denmark	28,680	26,445	21,104	11,364	2,655
Faroes	56,168	62,264	72,316	80,564	70,625
France	3,600	3,882		-	70,025
German Dem.Rep.	3,284	1,171	6,839	2,750	3,584
Germany, Fed.Rep.	825	994	626	2,750	266
Iceland	1,176		-	_	200
Ireland	-	_	668	16,440	3,300
Netherlands	150	1,000		8,888	5,627
Norway	185,646	211,773		283, 162 ²	191,012
Poland			201,101	200,102	131,012
Spain	318		_	_	_
Sweden	. 0.0	_	_		-
UK (Engl.& Wales)	_	33	_	_	3
UK (Scotland)		-	_	2 472	•
USSR	81,690	114,303	126,772	3,472 ₃ 127,613	3,310 165,497
Total	361,537	421,865	464,263	534,253	445,879

Table 4.4 Landings (t) of BLUE WHITING from the Icelandic mixed industrial trawl fisheries in Division Va, 1978-1987.

Country	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Iceland	9,484	2,500	-	-		7,000	-	-		

Preliminary.

2 Including directed fishery also in Division IVa.

Table 4.5 Landings (tonnes) of BLUE WHITING from the mixed industrial fisheries and caught as by-catch in ordinary fisheries in Divisions IIIa, IVa-c, Vb and IIa, 1978-1987, as estimated by the Working Group.

Country	1978	1979	1980	1981	1982
Denmark	54,804	28,932	49,947	35,066	34,463
Faroes	1,177	1,489	1,895	3,133	27,269
France	~	-	· <u> </u>	_	1,417
German Dem.Rep. ²	988	49	-	-	-
Germany, Fed.Rep.	1,514	13	252	-	93
Ireland	-	-	-	2,744	-
Netherlands	-	-		18,627	47,856
Norway	39,989	30,930	21,962 ³	_	
Poland ²	601	-	-	229	550
Spain	-	4 0 4 0		-	-
Sweden Sweden	648	1,249	1,071	1,955	1,241
UK (Engl.& Wales) ²	452	~	-	-	4,689
UK (Scotland) USSR ²	153	37	2		-
USSK		634	<u> </u>		-
Total	99,874	63,333	75,129	61,754	117,578
					· · · · · · · · · · · · · · · · · · ·
Country	1983	1984	1985	1986	1987 ¹
Denmark	38,290	48,939	35,843	57.315	28,541
Faroes	12,757	9,740	3,606 ⁵	57,315 5,678 ⁵	7,051 ⁵
France	249	•	_	_	_
German Dem.Rep.2	_	-	-		53
Germany, Fed.Rep.2	_	566	52	_	62
Ireland	_	-		-	-
Norway	62,591	58,038	54,522	26,941	24,969
Netherlands		122	130	1,114	-
Poland ²	-		-	-	-
Spain ,	-	-	_	-	_
Sweden 2	3,850	5,401	3,616	8,532	2,013
UK (Engl.& Wales) ²	_	-	-	-	-
UK (Scotland) USSR ²		-	-	-	. <u>-</u>
Total	117,737	122,806	97,769	99,580	62,689

¹ Preliminary.

Preliminary.
Reported landings in human consumption fisheries.
Including mixed industrial fishery in the Norwegian Sea.
Reported landings assumed to be from human consumption fisheries.
Including catches in Division Vb.

Table 4.6 Preliminary data on landings (t) of BLUE WHITING in 1988 based on returns on ICES Data Form 5 for 1988 and information from Working Group members.

Country	Area	<i>J</i> an	Feb	Mar	Apr	May	Jun	Jul	Total
Faroe Islands	Vb+VI	4,135	6,935	17,231	26,624	19,232	_		74,157
German Dem.Rep.	VIIg-k	-	394	2,891	-	-	-	_	3,285
Netherlands	AI AII			100 800					
Norway	IIa IVa Vb VIa VIIb,c VIIg,k	271 - - - -	287 - - - 42,768	1,140 176 650 12,541 1,301	. 4 1,864 - 51,332 40,255 504	11,915 16,938 25,220	2,271	1,520	4 19,268 17,114 79,113 52,796 49,963
UK (Scotland)	VIa VIIc	- -		-	1,783 1,355	1,233	- -	- -	3,016 1,355
USSR	I+II Vb	- 467	105 2,492	888 79	25,348	448 30,175	4,401 10,817	5,212 8,400	11,054 77,778
[otal									388,903

Table 4.5 Landings (tonnes) of BLUE WHITING from the mixed industrial fisheries and caught as by-catch in ordinary fisheries in Divisions IIIa, IVa-c, Vb and IIa, 1978-1987, as estimated by the Working Group.

Country	1978	1979	1980	1981	1982
Denmark	54,804	28,932	49,947	35,066	34,463
Faroes	1,177	1,489	1,895	3,133	27,269
France	-	-	<u> </u>	-	1,417
German Dem.Rep. 2	988	49	_	-	-
Germany, Fed.Rep.	1,514	13	252		93
Ireland Netherlands	-	-	-	2,744	45 056
Norway	39,989	30,930	24 0623	18,627	47,856
Poland ²	601	30,330	21,962 ³	220	550
Spain ,	-	_	_	229	550
Sweden ⁴	648	1,249	1,071	1,955	1,241
UK (Engl.& Wales)2	+		-	1,555	4,689
UK (Scotland)	153	37	2		-
USSR ²	-	634	<u>.</u>	-	_
Total	99,874	63,333	75,129	61,754	117,578
			-		
Country	1983	1984	1985	1986	1987 ¹
Denmark	38,290	48,939	35,843	57,315	28,541
Faroes	12,757	9,740	35,843 ₅ 3,606 ⁵	5,678 ⁵	7,051 ⁵
France	249	-	-	_	_
German Dem.Rep. 2	A44			**	53
Germany, Fed.Rep.	_	566	52	-	62
Ireland Norway	CO 504		- -	-	-
Norway Netherlands	62,591	58,038	54,522	26,941	24,969
Poland ²	_	122	130	1,114	
Spain .	_	_	_	_	
Sweden⁴	3,850	5,401	3,616	8,532	2,013
JK (Engl.& Wales) ²	- 7	- ,	-, -, -		-
UK (Scotland) USSR	<u>-</u>	-	_		-
Fotal	117,737	122,806	97,769	99,580	62,689

Preliminary.

Reported landings in human consumption fisheries.

Including mixed industrial fishery in the Norwegian Sea.

Reported landings assumed to be from human consumption fisheries.

Including catches in Division Vb.

 $\frac{\text{Table 4.6}}{\text{CES Data Form 5 for 1988 and information from Working Group members.}}$

Country	Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
Faroe Islands	Vb+VI	4,135	6,935	17,231	26,624	19,232	_	-	74,157
German Dem.Rep.	VIIg-k	-	394	2,891	-	-	-	-	3,285
Netherlands	VII VI			100 800					
Norway	IIa IVa Vb	- 271	287	1,140	· 4 1,864	11,915	2,271	- 1,520	4 19,268
	VIa VIIb,c	- -	-	176 650 12,541	51,332 40,255	16,938 25,220	1,911	-	17,114 79,113 52,796
	VIIg,k	-	42,768	1,301	504	-	-		49,963
UK (Scotland)	VIa VIIc	- -		-	1,783 1,355	1,233	-	-	3,016 1,355
USSR	I+II Vb	- 467	105 2,492	888 79	25,348	448 30,175	4,401 10,817	5,212 8,400	11,054 77,778
Total					<u>. </u>				388,903

Table 4.7 BLUE WHITING.

Catch in number (millions) by age group in the directed fisheries (Sub-areas I and II, Divisions Va, XIVa + b, Vb, VIa + b, VIIb,c and VIIg,h,j,k), 1978 - 1987.

Age	1978	1979	1980	1981	1982
0		_	-	**	1.2
1	_	_	55.1	4.0	1.7
2	63.6	69.9	319.5	40.1	48.6
3	69.0	165.0	362.0	322.8	123.1
4	345.8	457.5	399.1	225.3	371.0
5	436.9	468.3	478.3	501.5	212.6
6	483.1	569.0	530.9	539.0	251.0
7	527.9	743.2	725.3	448.5	250.7
8 9	474.3	904.8	779.2	618.3	259.3
9	364.8	826.4	694.5	573.2	278.7
10	307.6	797.0	1,008.7	718.3	259.8
11	157.4	473.2	398.1	343.6	158.5
12	121.8	359.2	394.2	232.6	133.6
13	50.4	142.7	66.8	73.9	41.0
14	20.5	69.3	64.6	49.5	45.3
15+	16.1	39.0	4.7	30.6	28.0
Total	3,439.2	6,405.4	6,191.0	4,721.2	2,464.1
Tonnes	465,454	1,025,599	1,017,491	809,054	427,341

Age	1983	1984	1985	1986	1987
0	2.5	63.6	871.4	51.9	9.1
1	290.4	417.6	127.4	161.9	280.8
2	239.1	1,394.1	1,341.6	263.3	361.0
3	164.1	277.9	1,588.1	1,559.5	580.2
4	194.1	211.9	199.3	1,464.3	1,780.2
5	411.4	259.2	161.0	298.7	680.3
6 ·	284.4	420.2	303.7	156.4	118.2
7	274.0	253.1	248.7	192.2	94.9
8	283.5	190.3	167.2	185.8	117.1
9	219.9	151.6	91.7	166.4	99.7
10	152.6	113.8	87.8	172.1	48.3
11	71.5	57.7	73.1	108.7	60.1
12	45.4	50.0	51.4	65.6	41.6
13	25.0	15.0	21.1	25.2	21.1
14	12.1	8.1	12.5	6.8	10.9
15+	10.0	6.7	9.5	8.1	13.0
Total	2,680.0	3,890.9	5,355.3	4,886.9	4,316.5
Tonnes	416,730	481,872	554,640	694,314	571,659

¹ Preliminary.

Table 4.8 BLUE WHITING.
Catch in number (millions) by age group in the mixed industrial fisheries (Subarea IV, Divisions IIIa, Vb, and Va) 1978 - 1987.

	····				
Age	1978	1979	1980	1981	1982
0	956.2	2.4	23.2	_	3,450.1
1	1,030.9	1,849.0	276.1	65.1	45.3
2	168.2	78.8	329.9	81.4	41.3
3	89.7	32.3	74.8	191.9	80.9
4	74.0	22.3	22.6	58.4	112.8
5	-	18.2	29.1	20.1	29.2
6	-	20.8	23.1	16.7	21.6
7	_	10.8	29.3	17.8	14.8
8		8.8	26.8	15.7	
9	_	14.0	15.2		12.0
1Ó	_	6.2	13.2	4.4	5.2
11	_	1.0	6.4	4.9	1.8
12	_			3.6	-
13		4.4	1.8	1.5	2.4
14	-	-	2.2	1.2	0.6
	_	_	1.4	0.1	0.6
15+	_	<u>-</u>	0.4	0.2	-
Total	2,319.0	2,069.0	860.8	483.0	3,816.6
Tonnes	109,358	94,995	75,129	61,754	117,578
					·
Age	1983	1984	1985	1986	1987 ¹
0	336.3	446.4	184.3	_	226.8
1	1,844.2	1,650.8	891.4	395.0	174.5
2	90.0	587.7	365.0	334.7	105.7
2 3 4	38.4	49.7	173.8	134.6	85.4
4	47.7	12.8	37.4	184.4	88.9
5	55.6	12.6	13.4	79.7	32.8
6	12.2	10.4	13.9	24.3	15.6
7	12.8	6.1	5.8	7.3	9.2
8	2.6	2.2	5.6	11.0	5.1
9	5.8	2.7	1.8	7.3	3.8
10	4.2	2.6	3.0	3.9	0.2
11	9.6	0.9	1.4	3.8	0.2
12	3.3	0.3	0.3	1.4	_
13	0.6		0.3		-
14	0.3	0.3	-	1.0	_
15+	V.3	0.1	_	1.1	-
Total	2,463.6	2,785.5	1,697.0	1,189.4	748.0
Tonnes	124,737	122,806	97,769	99,580	59,952

¹Preliminary.

Table 4.7 BLUE WHITING.

Catch in number (millions) by age group in the directed fisheries (Sub-areas I and II, Divisions Va, XIVa + b, Vb, VIa + b, VIIb,c and VIIg,h,j,k), 1978 - 1987.

Age	1978	1979	1980	1981	1982
0		_	-	-	1.2
1	_	-	55.1	4.0	1.7
2	63.6	69.9	319.5	40.1	48.6
3	69.0	165.0	362.0	322.8	123.1
4	345.8	457.5	399.1	225.3	371.0
5	436.9	468.3	478.3	501.5	212.6
6	483.1	569.0	530.9	539.0	251.0
7	527.9	743.2	725.3	448.5	250.7
8	474.3	904.8	779.2	618.3	259.3
9	364.8	826.4	694.5	573.2	278.7
10	307.6	797.0	1,008.7	718.3	259.8
11	157.4	473.2	398.1	343.6	158.5
12	121.8	359.2	394.2	232.6	133.6
13	50.4	142.7	66.8	73.9	41.0
14	20.5	69.3	64.6	49.5	45.3
15+	16.1	39.0	4.7	30.6	28.0
Total	3,439.2	6,405.4	6,191.0	4,721.2	2,464.1
Tonnes	465,454	1,025,599	1,017,491	809,054	427,341

Age	1983	1984	1985	1986	1987 ¹
0	2.5	63.6	871.4	51.9	9.1
1	290.4	417.6	127.4	161.9	280.8
2	239.1	1,394.1	1,341.6	263.3	361.0
3	164.1	277.9	1,588.1	1,559.5	580.2
3 4 5	194.1	211.9	199.3	1,464.3	1,780.2
5	411.4	259.2	161.0	298.7	680.3
6 : 7	284.4	420.2	303.7	156.4	118.2
7	274.0	253.1	248.7	192.2	94.9
8	283.5	190.3	167.2	185.8	117.1
9	219.9	151.6	91.7	166.4	99.7
10	152.6	113.8	87.8	172.1	48.3
11	71.5	57.7	73.1	108.7	60.1
12	45.4	50.0	51.4	65.6	41.6
13	25.0	15.0	21.1	25.2	21.1
14	12.1	8.1	12.5	6.8	10.9
15+	10.0	6.7	9.5	8.1	13.0
Total	2,680.0	3,890.9	5,355.3	4,886.9	4,316.5
Tonnes	416,730	481,872	554,640	694,314	571,659

¹Preliminary.

Table 4.8 BLUE WHITING.
Catch in number (millions) by age group in the mixed industrial fisheries (Subarea IV, Divisions IIIa, Vb, and Va) 1978 - 1987.

Age	1978	1979	1980	1981	1982
0	956.2	2.4	23.2		3,450.1
1	1,030.9	1,849.0	276.1	65.1	45.3
2	168.2	78.8	329.9	81.4	41.3
3	89.7	32.3	74.8	191.9	80.9
4	74.0	22.3	22.6	58.4	112.8
5	-	18.2	29.1	20.1	29.2
6	_	20.8	23.1	16.7	21.6
7	-	10.8	29.3	17.8	14.8
8	_	8.8	26.8	15.7	12.0
9	_	14.0	15.2	4.4	5.2
10	-	6.2	13.8	4.9	1.8
11	-	1.0	6.4	3.6	
12	-	4.4	1.8	1.5	2.4
13	-		2.2	1.2	0.6
14		-	1.4	0.1	0.6
15+		-	0.4	0.2	0.0
Total	2,319.0	2,069.0	860.8	483.0	3,816.6
Tonnes	109,358	94,995	75,129	61,754	117,578
					· · · · · · · · · · · · · · · · · · ·
Age	1983	1984	1985	1986	1987 ¹
0	336.3	. 446.4	184.3	-	226.8
1	1,844.2	1,650.8	891.4	395.0	174.5
2	90.0	587.7	365.0	334.7	105.7
3	38.4	49.7	173.8	134.6	85.4
4	47.7	12.8	37.4	184.4	88.9
5	55.6	12.6	13.4	79.7	32.8
6	12.2	10.4	13.9	24.3	15.6
7	12.8	6.1	5.8	7.3	9.2
8	2.6	2.2	5.6	11.0	5.1
9	5.8	2.7	1.8	7.3	3.8
10	4.2	2.6	3.0	3.9	0.2
11	9.6	0.9	1.4	3.8	
12	3.3	0.3	0.3	1.4	_
13	0.6	0.3		1.0	_
4	0.3	0.1	-	1.1	
15+		-	-	-	-
otal	2,463.6	2,785.5	1,697.0 1	,189.4	748.0
onnes	124,737	122,806	97,769	99,580	59,952

Preliminary.

Table 4.9 VIRTUAL POPULATION ANALYSIS

CATCH IN	NUMBERS	UNIT	: millior	าร						
•	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
0	956	2	23	0	3451	339	510	1056	52	236
1	1031	1919	331	69	45	2133	2068	1019	557	455
2	232	244	649	122	90	328	1982	1707	598	467
2	159	353	437	515	204	202	328	1762	1694	666
4	420	480	422	284	484	241	225	237	1649	1869
5	437	487	507	522	242	465	272	174	378	713
5	483	590	554	556	273	295	431	318	181	134
7	528	754	755	466	266	285	259	254	200	104
8	474	914	806	634	271	285	192	173	197	122
9	365	840	620	578	284	225	154	93	174	103
10	308	803	1023	723	262	156	116	91	176	48
11	157	474	405	347	159	81	59	74	113	60
12	122	364	396	234	136	49	50	52	67	41
13	50	143	69	75	42	26	15	21	26	21
14	21	69	66	50	46	12	8	12	8	11
15+	16	39	5	31	28	10	7	9	8	13
TOTAL	5758	8474	7067	5206	6281	5132	6676	7052	6078	5063

Table 4.10 VIRTUAL POPULATION ANALYSIS
BLUE WHITING, NORTHERN AREA

MEAN	WEIGHT	AT AGE	OF THE	STOCK	UNIT:	kilogram					
		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	12 13	.032 .030 .084 .105 .109 .129 .147 .160 .170 .177 .188 .193 .199 .200	.032 .030 .084 .105 .109 .129 .147 .160 .170 .177 .188 .193 .199 .200	.027 .036 .079 .107 .122 .135 .149 .165 .176 .186 .199 .202 .207	.032 .063 .092 .118 .135 .145 .155 .170 .178 .187 .199 .208 .228	.018 .046 .094 .136 .152 .162 .178 .195 .200 .204 .213 .234 .228	.018 .046 .094 .136 .152 .162 .178 .195 .200 .204 .213 .234 .228	.027 .036 .086 .104 .142 .157 .164 .176 .189 .186 .197 .202 .194 .225	.014 .038 .080 .102 .129 .164 .178 .200 .208 .218 .225 .233 .233 .243	.033 .040 .081 .113 .132 .168 .202 .209 .243 .246 .242 .255 .260	.021 .056 .092 .109 .125 .148 .178 .209 .221 .222 .251 .249 .252
:		.200 .200	.200 .200	.207 .207	.249 .257	.242 .258	.242 .258	.223 .242	.251 .279	.302 .305	.242 .266

Table 4.9 VIRTUAL POPULATION ANALYSIS

CATCH IN	NUMBERS	UNIT	: millior	าร						
i	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Ð	956	2	23	0	3451	339	510	1056	52	236
1	1031	1919	331	69	45	2133	2068	1019	557	455
2 3	232	244	649	122	90	328	1982	1707	598	467
	159	353	437	515	204	202	328	1762	1694	666
4 5	420	480	422	284	484	241	225	237	1649	1869
5	437	487	507	522	242	465	272	174	378	713
б	483	590	554	556	273	295	431	318	181	134
7	528	754	755	466	266	285	259	254	200	104
8 9	474	914	806	634	271	285	192	173	197	122
9	365	840	620	578	284	225	154	93	174	103
10	308	803	1023	723	262	156	116	91	176	48
11	157	474	405	347	159	81	59	74	113	60
12	122	364	396	234	136	49	50	52	67	41
13	50	143	69	75	42	26	15	21	26	21
14	21	69	66	50	46	12	8	12	8	11
15+	16	39	5	31	28	10	7	9	8	13
TOTAL	5758	8474	7067	5206	6281	5132	6676	7052	6078	5063

Table 4.10 VIRTUAL POPULATION ANALYSIS
BLUE WHITING, NORTHERN AREA

0 .032 .032 .027 .032 .018 .018 .027 .014 .00 1 .030 .030 .036 .063 .046 .046 .036 .038 .0 2 .084 .084 .079 .092 .094 .094 .086 .080 .0 3 .105 .105 .107 .118 .136 .136 .104 .102 .1 4 .109 .109 .122 .135 .152 .152 .142 .129 .1 5 .129 .129 .135 .145 .162 .162 .157 .164 .1 6 .147 .147 .149 .155 .178 .178 .164 .178 .2 7 .160 .160 .165 .170 .195 .195 .176 .200 .2 8 .170 .176 .178 .200 .200 .189 .208 .2 9 .177 .177 .186 .187 .204	MEAN WE	
1 .030 .030 .036 .063 .046 .046 .036 .038 .0 2 .084 .084 .079 .092 .094 .094 .086 .080 .0 3 .105 .105 .107 .118 .136 .136 .104 .102 .1 4 .109 .109 .122 .135 .152 .152 .142 .129 .1 5 .129 .129 .135 .145 .162 .162 .157 .164 .1 6 .147 .147 .149 .155 .178 .178 .164 .178 .2 7 .160 .160 .165 .170 .195 .195 .176 .200 .2 8 .170 .176 .178 .200 .200 .189 .208 .2 9 .177 .177 .186 .187 .204 .204 .186 .218 .2		1986 1987
10 .188 .188 .199 .199 .213 .213 .197 .225 .2 11 .193 .193 .202 .208 .234 .234 .202 .233 .2 12 .199 .199 .207 .228 .228 .228 .194 .233 .2 13 .200 .200 .207 .234 .258 .258 .225 .243 .2	10 11 12 13	.033 .021 .040 .056 .081 .092 .113 .109 .132 .125 .168 .148 .202 .178 .209 .209 .243 .221 .246 .222 .242 .251 .255 .249 .260 .252 .272 .274 .302 .242

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NORTHERN BLUE WHITING TUNING DATA 1988.
 104
 Norwegian Sea Acoustic
 82,87
 i,i
 3,14
 1, 1254,4778,3652,3172,2339,1692,887,425,263,271,86,51
    456, 779,1425, 594, 487, 450,346,222,105, 88,38, 7
     826, 393, 534, 544, 325, 56, 53, 61, 24, 45, 0, 0
 1,12525, 682, 418, 203, 245, 127,381,153, 59, 31,79,65
 1, 7201,6924,1863, 962, 348, 317,143,207, 54,152,27, 8
 1, 4894,5173,1383, 542, 219, 167, 99,103, 30, 87,15, 4
 USSR, Spawning Area/Acoustic
 82,87
1,1
 3,14
1, 0.54, 2.75, 1.34, 1.38, 1.57, 2.35, 1.73, 1.29, 0.65, .38, .11, .11
1, 2.33, 2.93,9.39,3.88,1.97,1.37, .78, .66,0.10,.07,.09, 0
1, 2.90, 0.80,1.10,4.20,2.20,1.20,1.70,1.20,0.50,.30, 0,
1,13.22, 0.93,0.58,1.78,0.86,0.61,0.58,0.54,0.11,.22,.06,.05
1,18.75,23.18,2.54,0.61,0.62,0.75,0.64,0.71,0.72,.50,.33,.11
1, 4.48,19.17,5.86,1.07,0.50,0.81,0.86,0.67,0.56,.53,.24,.03
Norway, Spawning Area/Acoustic
82,87
1,1
3,14
1,2431, 6676, 3335,3470,3656,3231,2239, 384,985,643,446,174
1,2108, 2723, 6511,3735,3650,3153,2279,1182,531,360, 69, 69
1,1514, 1616, 1719,1858,1128, 567, 440, 348, 80,122, 16, 14 1,9150, 1336, 999, 985,1115, 639, 370, 256,183, 43, 67, 8 1,7183, 7340, 1159, 383, 251, 373, 151, 174, 73, 18, 4, 6 1,8050,22357, 4697, 282, 417, 385, 159, 27,111, 31, 12, 0
USSR coue Div IIa, July
82,87
l,i
3,14
1, .12, .85,1.42,1.35,1.37, .46, .66,
                                               0, 0, 11,
    .31, .39,1.00, .92, .77, .96, .83, .54,.15,.22,
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    .56, .08, .22, .20, .05, .14, .08, .14, 0, 0,
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1, 5.84, .32, .03, .73, .57, .64, .57, .86, .19, .10,
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1,14.64,4.41, .55,
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1, 8.49, 7.95, 0.44,
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A VPA Version 2.1 - May 1988
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Table 4.12 Funing results.
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Age,	82,	â3,	84,	85,	86,	87,
Û,	.144,	.007,	.026,	.17û,	.009,	.050,
1,	.012,	.124,	.055,	.073,	.128,	.100,
2,	.035,	.114,	.162,	.058,	.056	.150,
3,	.059,	,lû2,	.160,	.212,	.076	.081.
4,	.136,	.092,	.157.	.166,	.314	,112,
5, 6,	.107,	.188,	.142,	.176,	.433,	.217
δ,	149,	.184,	.266,	.246,	.279.	268
7,	169.	.229,	.243,	.248,	.241.	.256.
₿,	.244,	.276,	.238,	.255,	.310,	.227,
9,	.414,	.329,	.236,	.173,	439	264
10.	.695,	.422,	.281,	.213,	.570.	.206.
11,	.690,	.479,	.278,	.292,	.444,	.387.
12,	1.039,	.472,	.621.	.422,	.467.	.285.
13,	.708,	.562	.257,	.584	.387.	260.
14,	709,	.453.	.335,	,337,	.461	.281,

Log catchability estimates

Age 3 Fleet,	82,	83,	84,	85,	86,	87
<u>-</u> ;	-1.01,	-1.47,	91,	.41,	-1.14,	52
				-6.44		
з,	35,	.06,	30,	.10,	-1.14,	02
4,-	10.27.	-8.76.	-8.20.	~7.26.	-7.33.	-6.88

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3		.23	269,	1.2529	.1047	.000E+	00,	.000E+00	. 225	.102
			1.061,				ũÜ,	.205E+00	,-10.49ū,	1.580
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Fleet,		83,	84,	85,	86,	87
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1,	.48.	55,	~1.28,	86.	.76.	87
			-7.46,			
3,	.39,	.97,	- 11	.01,	.28	.36
			-9.07			

, 9		tiai,Raiseo,	,	Slope ,	INTRCPT, SE Intrcpt
·	20 203 6	702 - 7023'		 ,	117
					387, .333
2, -6.8	58 , .943, .0	ŭl3 , .1528,	.000E+00,	.000E+00,	-6.680356
3, .3	32 , 405,1.3	716 , .2082,	.000E+00.	.000E+00.	.316, .153
4 , -9,0	34 , 1.548, .0	001 , 1912,	221E+00.	.3008+00,	-6.834, 2.306
foar	SIGMA(int.)	Śł⊊MA(ext.)	SiGMA(over	rail) Var	iance ratio
.215	.335	.130	.355		.150

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NORTHERN BLUE WHITING TUNING DATA
                                        1988.
 104
Norwegian Sea Acoustic
82,87
i,i
3,14
1, 1254,4778,3652,3172,2339,1692,887,425,263,271,86,51
    456, 779,1425, 594, 487, 450,346,222,105, 88,38, 7
ĺ,
     826, 393, 534, 544, 325, 56, 53, 61, 24, 45, 0, 0
1,12525, 682, 418, 203, 245, 127,381,153, 59, 31,79,65
1, 7201,6924,1863, 962, 348, 317,143,207, 54,152,27, 8
1, 4894,5173,1383, 542, 219, 167, 99,103, 30, 87,15, 4
USSR, Spawning Area/Acoustic
82,87
1,1
3,14
1, 0.54, 2.75, 1.34, 1.38, 1.57, 2.35, 1.73, 1.29, 0.65, .38, .11, .11
1, 2.33, 2.93,9.39,3.88,1.97,1.37, .78, .66,0.10,.07,.09, 0
1, 2.90, 0.80,1.10,4.20,2.20,1.20,1.70,1.20,0.50,.30, 0,
1,13.22, 0.93,0.58,1.78,0.86,0.61,0.58,0.54,0.11,.22,.06,.05
1,18.75,23.18,2.54,0.61,0.62,0.75,0.64,0.71,0.72,.50,.33,.11
1, 4.48,19.17,5.86,1.07,0.50,0.81,0.86,0.67,0.56,.53,.24,.03
Norway, Spawning Area/Acoustic
82,87
1,1
3,14
1,2431, 6676, 3335,3470,3656,3231,2239, 384,985,643,446,174
1,2108, 2723, 6511,3735,3650,3153,2279,1182,531,360, 69, 69
1,1514, 1616, 1719,1858,1128, 567, 440, 348, 80,122, 16, 14
1,9150, 1336, 999, 985,1115, 639, 370, 256,183, 43, 67, 8
1,7183, 7340, 1159, 383, 251, 373, 151, 174, 73, 18, 4, 6
1,8050,22357, 4697, 282, 417, 385, 159, 27,111, 31, 12, 0
USSR cpue Div IIa, July
82,87
1,1
3,14
   .12, .85,1.42,1.35,1.37, .46, .66,
                                               0, 0,.11,
   .31, .39,1.00, .92, .77, .96, .83, .54,.15,.22,
                                                              0,.05
   .56, .08, .22, .20, .05, .14, .08, .14, 0, 0,
                                                              0,
                                                                 - 0
1, 5.84, .32, .03, .73, .57, .64, .57, .86, .19, .10,
                                                             Q,
                                                                  Û
1,14.64,4.41, .55,
                                 0, 0,
                                                             0,
                       0, .10,
                                              0, 0, 0,
                                                                  0
1, 8.49,7.95,0.44,
                       Û,
                             0, . 0, .34,
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A VPA Version 2.1 - May 1988
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Age,	82,	83,	84,	65 ,	86,	87,
û,	.144,	.007,	.028,	.170,	.009,	.050,
ì,	.012,	.124,	.055,	.073,	.128,	.100,
2,	.035,	.114,	.162,	.058,	.056,	150,
3,	.059,	,102,	.160,	.212,	.076,	.081,
4,	،136,	.092,	.157	.166,	.314,	.112,
5,	.107,	.188,	.142,	.176,	.433,	.217,
6,	.149,	.184,	.266,	.246,	.279,	.268,
7,	.169,	.229,	.243,	.248,	.241,	,256,
8,	.244,	.276,	.238,	.255,	.310,	.227,
9,	414,	.329,	.236,	.173,	.439	.264.
10.	.695,	.422,	.281,	.213,	.570,	.206,
11,	.690,	.479,	.278,	.292,	.444,	.387,
12,	1.039,	.472,	.621,	.422,	.467,	.285,
13,	.708,	.562.	.257,	.584,	.387,	.260,
i4,	.709,	.453,	.335,	.337,	.461,	.281,

Log catchability estimates

Age Fieet	, 82,		84,			
1	, -1.01, -8.76,	-1.47,	91,	.41,	-1.14,	52
3	35, -10,27.	.06.	30,	.10,	-1.14	02

SummARY SI Fieet , Pred. , SE(q),A	artiai,Raiseo,		SE , IATROPT, S Stope , , , , , int	
1 , -,77 , ,709,	.4617 , .0628,	.000E+00	.000E+00773.	.268
2 , -7.19 , .934,			.000ξ+00, -7.186,	
3 ,28 , .498,	.75870528.		000E+00,276,	
4 , -6.53 , .586,	.0015 , .1141,	.634E+00, .	113E+0012.871.	.872
Foar SIGMA(int.)	\${GMA(ext.)	SiGMA(overa	ill) Variance ratio	1
.080 .315	.168	.315	.264	

	82,					
	.30, -7.16,	-1.21,	-1.29,	74,	.28,	-1.17
3,	.63, -8.34,	.04,	.12,	- 06	.33,	.29

Fîeet , Preo. ,	HMARY STATISTICS SE(q), Partial, Raised, FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF		,INTRÈPT, SE e , ,Intropt
1, ~.54,	.803, .5272 , .1905, .805, .0011 , .1054,	.000E+00, .000	E+00,640, .303 E+00, -6.829, .304
4 , -7.63 , Fbar SIG	.269,1.2529 , .1047, 1.061, .0005 , .1140, MA(int.) SIGWA(ext.) .237 .971E-01	.000E+00, .000 .286E+00, .205i SIGMA(overall)	E+00, .225, .102 E+00,-10.490, 1.580 Variance ratio

Fleet,	82,	83,	84,	85,	86,	87
	٠٠.		,			
1,	. 48	55,	~1.28,	86,	.76,	~.87
2,	7.43,	-5.57,	-7.46,	-7.44,	-5.84.	-6.33
3,	.39	.97,	11,	.01,	.28	. 36
4,	~7.37,	-7.81,	-9.07.	-10.41,	-7,37,	~8.92

,	Pred. q	,	Partial, F,	Řaised, F,	SLOPE ,	Slope		Intropt
1 , 2 , 3 ,	39 -6.68 .32	, .882,	, 6792 , 0013 , 3716	.3502, .1528, .2082,	.000E+00. .000E+00. .000E+00.	000£+0 000£+0 000£+0	iù387.	.333 .356 .153
Foar	- s	IGnA(int.)	SIG	ňA(ext.)	SIGMA(c	overall) V	ariance rat	ito

```
Age 6
Fleet,
                              82,
                                                  83.
                                                                     84.
                                                                                         85,
                                                                                                            86.
                                                                                                                                87
           1 . .55, -.99, -1.09, -1.85, .39, .08
2 , -7.19, -6.03, -5.95, -6.59, -6.97, -6.15
3 , .64, .84, .14, -.27, -.53, -.57
4 , -7.21, -7.46, -9.00, -7.48, -11.59, -11.33
                                                                                                SUMMARY STATISTICS
Fleet , Pred. , SE(q),Partial,Raised,
, q , , F , F .,
                                                                                                                                                                                                                                                                          ,IhTRCPT, SE
, ,Intrcpt
                                                                                                                                                                                                              SLOPE
                                                                                                                                                                                                                                      , Slope ,
                                                                                                                                                                                                           ..., ,Intropt
.000E+00, .000E+00, -.485, .394
.000E+00, .000E+00, -6.479, .212
.000E+00, .000E+00, .042, .246
.899E+00, .290E+00, -2.273, 2.229
) SIGMA(overall) Variance ratio
.380 .513
                                                                                                        1 , -.49 , 1.042 , 6154 , .1522 , 2 , -6.48 , .561 , .0015 , .1922 , 3 , .04 , .650, 1.0424 , .4953 , 4 ,-11.26 , 1.497 , .0000 , .2877 , Fbar SIGMA(int.) SIGMA(ext.) .265 .380 .273
 Age 7
Fieet.
                            82.
                                                83.
                                                                    84.
                                                                                        85,
                                                                                                           86. 87
         1, .40, -.94, -1.19, -1.43, -.87, -.62
2, -6.91, -6.45, -6.18, -7.08, -7.20, -6.70
3, .85, 1.08, .05, .09, -1.20, .03
4 . -7.04, -7.39, -9.78, -7.49, -9.02, -11.12
                                                                                                                                     SUMMARY STATISTICS
                                                                                              Fieet , Fred. , SE(q), Partial, Raised, SLOPE , q , , F , F ,
                                                                                                                                                                                                                                                  SE. INTROPT, SE
Slope , Intropt
                                                                                                       1 , -.77 , .689, .4613 , .2191, .000E+00, .000E+00, -.774, .260
2 , -6.75 , .419, .0012 , .2428, .000E+00, .000E+00, -6.753, .159
3 , .15 , .861,1.1610 , .2895, .000E+00, .000E+00, .149, .326
4 ,-10.29 , 1.445, .0000 , .5910, -.658E+00, .280E+00, .3711, 2.153
Fbar SIGMA(int.) SIGMA(ext.) SIGMA(overall) Variance ratio
.254 .322 .121 .322 .141
Age 8
Fleet,
                           82,
                                              83,
                                                                  84,
                                                                                      85,
                                                                                                         86.
       1, .42, -.83, -2.67, -1.68, -.70, -1.17
2, -6.16, -6.63, -6.51, -7.02, -6.74, -6.50
3, 1.07, 1.12, -.35, -.06, -.53, -.33
4, -7.79, -6.98, -8.66, -6.97, -11.57, -11.40
                                                                                                                                   SUMMARY STATISTICS
                                                                                             Freet , Pred. , SE(q), Partial, Raised,
                                                                                                                                                                                                           SLOPE , SE ,INTROPT, SE , Slope , ,Intropt
                                                                                                     1 , -1.10 , 1.117 , 3318 , .2424,

2 , -6.59 , .308, .0014 , .2666,

3 , .15 , .805,1.1626 , .3684,

4 ,-11.05 , 1.864 , .0000 , .3236,

Foar SIGNA(int.) SIGNA(ext.)

.225 , .276 , .112
                                                                                                                                                                                                           .000E+00, .000E+00, -1.103, .422
.000E+00, .000E+00, -6.592, .116
.000E+00, .000E+00, .151, .304
-861E+00, .361E+00, -2.435, 2.777
SIGMA(overall) Variance ratio
.276 .165
                                            83,
                                                                84,
                                                                                85, 86, 87
      1, .26, -.68, -2.51, -.34, -1.02, -1.37
2, -5.98, -6.78, -5.95, -6.83, -6.43, -6.12
3, 1.18, 1.20, -.40, -.37, -.97, -.90
4, -6.95, -6.72, -9.01, -6.85, -11.10, -11.08
                                                                                           SUMMARY STATISTICS
Fleet , Pred. , SE(q),Partial,Raised, SLOPE , SE ,IMTRCPT, SE , q , , F , F , , , Slope , ,Intrcpt
                                                                                                  1 , -.95 , 1.027, 3885 , 4043, .000E+00, .000E+00, -.945, .388
2 , -6.35 , .423 , .0018 , .2096, .000E+00, .000E+00, -6.348, .160
3 , -.04 , 1.066, .9500 , .6219, .000E+00, .000E+00, -.041, .403
4 ,-10.88 , 1.702 , .0000 , .3238 , -.905E+00 , .330E+00 , -1.831, 2.535
fbar SIGMA(int.) SIGMA(ext.) SIGMA(overall) Variance ratio
.262 .359 .220 .359 .377
```

Age 10 Fieet, 82, 83, 84, 8	85, 86, 8	7		
1 , .12,51, -1.91, -1.6 2 , -5.68, -6.33, -5.84, -6.6	76.085.8	5		
3 , .02, 1.16,17,6 4 ,-11.05, -6.53, -7.99, -6.2	1,57, -2.1 1,-10.85, -6.5	5 3		
	Fleet , Pred	Summary STATISTICS , , SE(q),Partial,Raised, , , , , , , , ,		E ,]NTRCPT, SE ope , ,(ntrcpt
	1 ,70 2 , -6.00 3 ,30 4 , -7.38 Fbar .205	7 , .401, .6023 , .1649, 7 , 1.161, .6897 ,1.2261,	.000E+00, .0 .000E+00, .0 .326E+00, .5	00E+00,757, .281 00E+00, -6.074, .151 00E+00,371, .439 71E+00,-10.638, 4.395 1) Variance ratio .919
Age 11 Fleet, 82, 83, 84, 8	5, 86, 87	,		
1, .14,46, -2.18, -1.4 2, -5.87, -7.43, -6.05, -7.7 3, 1.46, 1.15,98,3 4, -10.55, -7.03, -10.47, -7.2	4, -5.87, -5.62 3, -1.25,33			
	, q		. Sic	. ,INTROPT, SE
	3 ,05 4 , -9.75	, .985, .0016 , .1726, .1.198, .9537 , .5155,	.000E+00, .00 .000E+00, .00 161E+00, .45	0E+00, -1.195, .349 0E+00, -6.431, .372 0E+00,047, .453 7E+00, -8.134, 3.518) Variance ratio .331
Age 12 Figet, 82, 83, 84, 85	, 86, 87			
1 , .73,16,58, -1.38 2 , -5.84, -7.30, -5.59, -6.33 3 , 1.59, 1.24, .42, -1.05 4 , -7.08, -6.16, -9.50, -7.12	, -5,66, -5,60 , -2,08, -1,53			
	Fleet , Prea.	SUMMARY STATISTICS , SE(q), Partial, Raised,	SLOPE , SE , Sion	
	2 , -6.05 3 , -,23 4 ,-10.08	, 1.652, .7907 ,1.0458, , 1.606, .0000 , .2864, -	.000E+00, .000 .000E+00, .000 .697E+00, .313	05+00,307, .288 0E+00, -6.054, .274 0E+00,235, .624 E+00, -3.109, 2.393 Variance ratio .357
Age 13 Fleet, 82, 83, 84, 85, 1, .38, -20, -4.29, .79, 2, -6.28, -6.24, -9.18, -6.40,	91, -1.68 -5.32, -5.82			
3 , 2.03, .40, -1.29, .62, 4 , ~5.04, ~8.95, -9.18, -8.70,	-2.82, -1.91 -9.32, -9.51			
_	Fleet , Pred.	, F, F,	SLOPE , SE , Slop	
	3 ,50 4 ,-10.09	, 1.463, .0014 , .1264, . 1.959, .6091 ,1.0659,	.000E+00, .0000 .000E+00, .0000 .656E+00, .3120	E+00,986, .754 E+00, -6.540, .553 E+00, -495, .740 E+00, -3.529, 2.400 Variance ratio .338

```
Age 6
Fleet,
                                 82,
                                                     83,
                                                                        84,
                                                                                           85,
                                                                                                               86.
                                                                                                                                   87
             1, .55, -.99, -1.09, -1.85, .39, .08
2, -7.19, -5.03, -5.95, -6.59, -6.97, -6.15
3, .64, .84, .14, -.27, -.53, -.57
4, -7.21, -7.46, -9.00, -7.48, -11.59, -11.33
                                                                                                   SUMMARY STATISTICS
Fleet , Pred. , SE(q), Partial, Raised,
, q , , F , F .,
                                                                                                                                                                                                                   SLOPE
                                                                                                                                                                                                                        SLOPE , SE ,INTROPT, SE , Slope , ,Intropt
                                                                                                           1 , -.49 , 1.042, .6154 , .1522, .000E+00, .000E+00, -.485, .394
2 , -6.48 , .561, .0015 , .1922, .000E+00, .000E+00, -6.479, .212
3 , .04 , .650,1.0424 , .4953, .000E+00, .000E+00, .042, .246
4 ,-11.26 , 1.497, .0000 , .2877, -.899E+00, .290E+00, -2.273, 2.229
Fbar SIGMA(int.) SIGMA(ext.) SIGMA(overall) Variance ratio
.265 .380 .273 .380 .513
   Age 7
Fieet,
                                                   83,
                                                                                          85,
                                                                                                             86, 87
           1, .40, -.94, -1.19, -1.43, -.87, -.62
2, -6.91, -6.45, -6.18, -7.08, -7.20, -6.70
3, .85, 1.08, .05, .09, -1.20, .03
4, -7.04, -7.39, -9.78, -7.49, -9.02, -11.12
                                                                                                 SUMMARY STATISTICS
Fleet , Pred. , SE(q),Partial,Raised, SLOPE
, q , , F , F ,
                                                                                                                                                                                                                                                    SE. ,INTROPT, SE
Slope , ,Intropt
                                                                                                        1 , -.77 , .689, .4613 , .2191, .000E+00, .000E+00, -.774, .260
2 , -6.75 , .419, .0012 , .2428, .000E+00, .000E+00, -6.753, .159
3 , .15 , .861,1.1610 , .2855, .000E+00, .000E+00, .149, .326
4 ,-10.29 , 1.445, .0000 , .5910, -.658E+00, .280E+00, -3.711, 2.153
Fbar SIGMA(int.) SIGMA(ext.) SIGMA(overall) Variance ratio
.254 .322 .121 .322 .141
  Age 8
  Fleet,
                        82.
                                                 83,
                                                                     84,
                                                                                        85,
                                                                                                           86,
         1, .42, -.83, -2.67, -1.68, -.70, -1.17
2, -6.16, -6.63, -6.51, -7.02, -6.74, -6.50
3, 1.07, 1.12, -.35, -.06, -.53, -.33
4, -7.79, -6.98, -8.66, -6.97, -11.57, -11.40
                                                                                                1 , -1.10 , 1.117 , 3318 , .2424 , .000E+00 , .000E+00 , -1.103 , .422  
2 , -6.59 , .308 , .0014 , .2066 , .000E+00 , .000E+00 , -6.592 , .116  
3 , .15 , .805,1.1626 , .3684 , .000E+00 , .000E+00 , .151 , .304  
4 ,-11.05 , 1.864 , .0000 , .3226 , .861E+00 , .361E+00 , -2.435 , 2.777  
Foar SIGMA(int.) SIGMA(ext.) SIGMA(overall) Variance ratio .225 , .276 , .112 , .276 , .165
Age 9
Fleet,
                          82,
                                              83,
                                                                84,
                                                                                  85, 86, 87
       1, .25, -.68, -2.51, -.34, -1.02, -1.37

2, -5.98, -6.78, -5.95, -6.83, -6.43, -6.12

3, 1.18, 1.20, -.40, -.37, -.97, -.90

4, -6.55, -6.72, -9.01, -6.85, -11.10, -11.08
                                                                                              SUMMARY STATISTICS

Fleet , Pred. , SE(q), Partial, Raised, SLOPE , SE , INTRCPT, SE , q , , F , F , , , Slope , , Intrcpt
                                                                                                     1 , -.95 , 1.027, .3886 , .4043, .000E+00, .000E+00, -.945, .388
2 , -6.35 , .423, .0018 , .2096, .000E+00, .000E+00, -6.348, .160
3 , -.04 , 1.066, .9600 , .6219, .000E+00, .000E+00, .041, .403
4 ,-10.88 , 1.702, .0000 , .3238, -.905E+00, .330E+00, -1.831, 2.535

Fbar SIGMA(int.) SIGMA(ext.) SIGMA(overall) Variance ratio
.262 .359 .220 .359 .377
```

	-		
Age 10			
	15, 86, 8		
1 , .12,51, -1.91, -1.6	3,40,8		
2 , -5.68, -6.33, -5.84, -6.6 3 , .02, 1.16,17,5	i7, -6.08, -5.89 i1572.19		
4 ,-11.05, -6.53, -7.99, -6.2	1,-10.85, -6.5		
	Fleat . Pred.	SUBMARY STATISTICS , SE(q),Partial,Raised, SLOPE	, SE ,INTROPT, SE
	, q	, , , , , , , , , , , , , , , , , , ,	, Slope , ,Introp
	1 ,76	, .744, .4690 , .2185, .000E+0	0, .000E+00,757, .281
	2 , -6.07	.401, .00231649000E+0	0, .000E+ 00 , -6.074, .151
	4 , -7.38	. 2.950, .0006 , .0884, .326E+0	0, .571E+00,-10.638, 4.399
	fbar .205	SlūmA(int.) SlūmA(ext.) SlūmA .335 .321 .3	(overall) Variance ratio 35 .919
Age 11			
	5, 86, 87		•
1 , .14,48, -2.18, -1.4	-1.55, -1.64		
2 , -5.87, -7.43, -6.05, -7.7 3 , 1.46, 1.15,98,3	4, -5.87, -5.62 3, -1.25,33		
410.55, -7.03,-10.47, -7.20	0,-10.66,-10.16		
•			
	Fleet , Pred.	SUMMARY STATISTICS , SE(q), Partial, Raised, SLOPE	, SE ,INTROPT, SE
	, 9	, , F , F , ·	, Stope , ,Intropt
	1 , -1.20	, .923, .3026 , .6052, .000E+00	
	3 ,05	9650016 , .1726000E+00	, .000E+00, -6.431, .372 -, .000E+00,047, .453
	4 , -9.75 Fbar 3	, 1.198, .95375155, .000E+00 , 2.362, .0001 , .5844,161E+00 IGMA(int.) SIGMA(ext.) SIGMA	457E+00, -8.134, 3.518
	.383	.570 .328 .57	OLCUBILIA 193 JOUICE LECTO
Age 12			
Fleet, 82, 83, 84, 85			
1 , .73,16,58, -1.38	, .05,50 -5.66 -5.60		
2 , -5.84, -7.30, -5.59, -6.33 3 , 1.59, 1.24, .42, -1.05	, -2.08, -1.53		
4 , ~7.08, -6.16, ~9.50, ~7.12	,-10.08,-10.08		
	•	SUMMARY STATISTICS	
	Fleet , Preo.	, SE(q),Partial,Raised, SLOPE	
	, q	, ,	
	1 ,31. 26.05	, .762, .7358 , .3468, .000E+00 , .724, .0023 , .1817, .000E+00	
	3 , -,23	, 1.652, .7907 ,1.0458000E+00.	.000E+00,235, .624
	fbar 5	. 1.606, .0000 , .2864,697E+00, GmA(int.) SIGMA(ext.) SIGMA(.311E+00, -3.109, 2.393 overail) Variance ratio
	, 282	.478 .286 .478	
Age 13 Fleet, 82, 83, 84, 85,	86, 87		
2 , -6.28, -6.24, -9.18, -6.40,	91, -1.68 -5.32, -5.82		
3 , 2.03, .40, -1.29, .62, 4 , -5.04, -8.95, -9.18, -8.70,	-2.821.91		
. ,, 0,55, 5,20, -0,70,	J.JE, -7.31		

, q	SUMMARY STATISTICS , SE(q),Partial,Rais , , F , F	,	Slope , ,Intropt
1 ,99 2 , -6.54 3 ,50 4 ,-10.09 Fbar S	, 1.994, .3731 , .52 , 1.463, .0014 , .12 .1.959, .6091 ,1.06 , 1.611, .0000 , .14	23, .000E+00, 64, .000E+00, 59, .000E+00, 50,656E+00, xt.) SIGMA(ove	.000E+00, -6.540, .553 .000E+00,495, .740 .312E+00, -3.529, 2.400 erall) Variance ratio

Table 4.13 VIRTUAL POPULATION ANALYSIS from tuning.

	1978-85	000000000000000000000000000000000000000	44444444444444444444444444444444444444	
.20	1987	20. 21. 20. 20. 20. 20. 20. 20. 20. 20. 20. 20	222222222222222222222222222222222222222	.10
COEFFICIENT =	1986	10.10.00.8	1 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	.06
	1985	71. 00. 06. 12.	14400110040*** 144001100844	.22
MORTALITY	1984	00.0. 804.	333688388888888888888888888888888888888	.08
NATURAL	1983	12110	111000444044 20000000000000	0.1. 80.4.
Year-1	1982	4.000.4. 4.000.4	11.1.24.2.1.24.2.1.1.2.1.1.1.1.1.1.1.1.1	.06 .16
UNIT: Ye	1981	00.00.00.00.00.00.00.00.00.00.00.00.00.	2.20 2.27 2.20 1.00 2.20 2.20 2.20 2.20 3.20 3.20 3.20 3	.02
ENT	1980		21.22. 22.4. 23.22. 23.24. 23.25. 23.25. 23.25. 23.25. 23.25.	.05
COEFFICIENT	1979	00000 0000 400		9 9 9 9
ITY	1978	0.1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0	8011122122 80112222222222222222222222222	 0.4.
FISHING MORTAL		O 4 4 W 4 :	11 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	(0- 2)u (4- 8)u

Table 4.14 VIRTUAL POPULATION ANALYSIS from tuning.

STOCK SIZE IN NUMBERS UNIT: millions

BIOMASS TOTALS UNIT: thousand tonnes

ALL VALUES ARE SIVEN FOR 1 JANUARY

1978-85	17709	14221	1004Z	2270	D (1)	00000	0.00 0.00 0.00	7,770 04,00	0 CC	אות המלי	7 to T T	624	357	i tr) (1	y (2 1, ′±				
1588		4195	70%¢	7007	1621	757.7	300) (°	7 17 7	\$ 6 \$ 6 \$ 6	χ : Ο :	1,90	115	ζΥ ,-) ti	67			-	
1987	5335	5267	0 0 0 0 0 0	0 0 0 0 0 0 0 0	することを	(m (m () ()	90K	664	7 0 0	1 to	010	/07	183	102	0 1 1	L FU OS V	56710	33148	5541	4323
1986	6490	07TC	44334 95891	4444	17.83	820	1031	816	10 11 11 11	1 () f t	***	198	80	74	12	62062	37107	6427	4682
1985	7416	33710	V C C C C C C C C C C C C C C C C C C C	171	1193	1609	1276	848	545	1 2 2 2 2 2	100	575	105	52	45	32.6	75666	30210	5974	3366
1984	20361	145.40	2451	1705	2264	2032	1320	1000	810	500	いいいいい	, c	277	73	en en	27	90708	22252	5327	2575
1983	53014	4044 4355	2305	3031	2993	1937	1535	1302	884	497	0.00) -) -	747	99	36	30	91579	17895	4770	2727
1982	28494	2915	3927	4188	2633	2174	1882	1378	918	570	347	- 6 - 6 - 6	440	χ Σν	8	60	54050	18283	4109	3153
1981	5066 3636	4931	5682	3528	3230	2910	2132	1815	1327	1208	656	0 12) () () (707	ਰ ਹ	ଥିତ	36903	24469	4401	3626
1980	4467	7656	4791	4409	4113	3291	3045	2503	2155	1914	884	677	~ () ~ ()	⊃	ママイ	11	45638	308/0	5 T D D	43/3
1979	7865	6120	5775	5552	4500 500 5	かり (な) (す)	, xx	3635	3260	1357	1346	627	- 6 6 6	700	166	Q 4	&0339	7007 0007	0230	274¤
1978	15052 8610	7309	6956	6026	5817	V / / V	070c	4004 4004	7/27	1982	939	939	α ii C	7	177	25	71293	07/74 07/74	0 0 0 0 0 0	7000
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Table 4.13 VIRTUAL POPULATION ANALYSIS from tuning.

	1978-85	3000444446 800044446666666666666666666666	
.20	1987 15	591163175555888888888888888888888888888888888	.21
CIENT =	1986	040000422004044044	9.0°.
Y COEFFICIENT	1985	71000111222212224888888888888888888888888	.10
MGRIALITY	1984	0011112222222 0011112222222 000111122222222	.08
NATURAL	1983	10.11.10.11.12.12.44.44.44.44.44.44.44.44.44.44.44.44.44	5. 85 5.
Year-1	1982	4.0.00411114446 4.000411114466 4.00041111	16 16
UNIT: Ye	1981	00.000.000.000.000.000.000.000.000.000	.02
	1980	00014444888800 4004446888800 400888	0.4 84
COEFFICIENT	1979	0.0.0.0.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4	٥ ۵ ک
RIALITY	1978	0400004444 74400004444	80. 01.
FISHING MORTALI		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	(0- 2)u (4- 8)u

Table 4.14 VIRTUAL POPULATION ANALYSIS from tuning.

STOCK SIZE IN NUMBERS
UNIT: millions
BIOMASS TOTALS
UNIT: thousand tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

1978-85	17709	エキイイエコのこと	1004 7007	9.450 9.750	33.00	2550	2520	2103	1 10 10 10	1000		# 7 O	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	158 158	υ τυ Ω '⊣			
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1987	10 10 10 10 10 10 10 10 10 10 10 10 10 1	36.00 36.00 36.00	0.00 0.00 0.00 0.00	19612	4052	68.9	503	664	491	7 Y Y	700	707 703	0 C	ZOT	4 R)	56710	33148 5543	4323
1985	6490	10350	25821	6729	1188	820	1031	816	533	445	247	000	9 0 1	η ς Ο C	7 7 7 7 7 7	62062	5427	4682
1985	7416	33410	10193	1711	1193	1609	1276	848	645	524	474) i	H C	4 4	3.4 3.4 3.4	75666	5974	3356
1984	20361	14631	2451	1705	2264	2032	1320	1000	810	522	267	- 4 - 4	4 10	, w	27	90709	5327	2575
1983	53014	3355	2305	3031	2993	1937	1535	1302	884	497	233	142	יני ער ו) \rangle	300	91579	4770	2727
1582	28494 4147	2915	3927	41.88	2633	2174	1882	1378	918	570	347	228	00	0	60	54050	4109	3153
1981	5066 3636	4931	2682	3528	3230	7910	2135	1815	1327	1208	656	362	202	4	38	36903	4401	3626
1980	4467 6388	7556	4791	4409	4113	1000円	なされない	2503 113	2125	1914	884	677	190	144	11	45638 30870	5156	4373
1979	7805 11461	6120	5775	55 15 15 15 15 15 15 15 15 15 15 15 15 1	4 3 3 3 4 5	からなか	0 0 0 0 0 0 0 0 0	250 20 20 20 20 20 20 20 20 20 20 20 20 20	3250	1827	1346	627	332	166	9 4	60939 37992	6236	υ24α α
1978	15052 8610	7309	690 900 900 900 900 900 900 900 900 900	ου2ο Γυνα) (10) (10) (10) (10)	4 C	0000 0000	4 0 0 0 0 0 0 0	77.77	1201 1001	938	539	258	117	55	71293	7085	7000
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Title : SLUE WHITING, NÖRINERN AREA At 13.35.31 27 SEPTEMBER 1988 from 78 to 87 on ages û to 14 With Terminal F of .250 on age 7 and Terminal S of 1.000

127.920 and 62.567 after 113 iterations Initiai sum of squared resiquals was finaí sum of squared resiquaís is

Matrix of Residuals

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83/84	~,208	.300	.108	147	280	7.14Ď	206	680	48.5	.297	.129	071	124	.407	.000	1.000		83 .2796			10 1.9585
82/83	2.229	-2.209	552	4.054	.034	266	223	218	131	4 1 1 1 1 1	.503	.790	.528	.636	000.	i.000		82 .2490		5417	9 1.4217
81/82	-3.801	809	576	140	168	.257	.232	490.	.149	.254	.494	.209	.230	ন জ	.000	1.600		81 .3047		3933	8 1.2632
80/81	.592	. 706	.418	.467	-,300	1,245	097	071	091	1.473	.286	.038	.411	989.	.000	1.000		80 .2887		2,2564	7,0000
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Y © © © T © © © S	ر (((((((((((((((((((7 / 7	د/ x د د د	رار د ا	4/ S	0 I	/ · ·		2/20	יינ/א יינ/איי	TT/07	21/11	12/13	13/14		90 1- .*	Fishing M	F-values	Seiection-a	S-vaiues	S-values

Table 4.16 VIRTUAL PUPULATION AWALYSIS from separable VPA.

	1978-85	20.00.00.00.00.00.00.00.00.00.00.00.00.0	
.20	1587	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	.22
ICIENT =	1986	0.05 0.05 0.10 0.10 0.10 0.10 0.10 0.10	.04 08.
IY COEFF	1985	20.00.00.00.00.00.00.00.00.00.00.00.00.0	.25
NATURAL MÜRTALITY CGEFFICIENT	1984	03 110 128 128 128 128 128 128 129 129 129	.24
NATURAL	1983	0.00 111 120 130 140 150 150 150 150 150 150 150 150 150 15	.06
Year-1	1982	010001111111111111111111111111111111111	.05
UMIT: Ye	1981	000011010004081818088888888888888888888	.02
- 2 3	1980	100.111222242222222222222222222222222222	.25
COEFFICIENT	1979	022001111222224422222222222222222222222	94.
MORTALITY	1978	0.400000000000000000000000000000000000	0. 10.
FISHING MO			(0- 2)u (4- 8)u

Title : BLUE WHITING, NÜRIMERN AREA At 13.35.31 27 SEPTEMBER 1988 from 78 to 87 on ages û to 14 With Terminaî F of .250 on age 7 and Terminaî S of 1.000 Initiai sum of squared resignals was 127.920 and final sum of squared resignals is 62.567 after 113 iterations

Matrix of Residuais

200. 204. 204. 208. 208. 2000. 000 ...240 ...379 ...053 ...063 ...063 ...063 000. -.804 -,434 3271 1.000 2.2347 .000 2,496 418 376 376 376 1,376 1,376 1,189 1, 85. 1.000 1.7865 84 .2709 .000 1.000 1.9585 .294 .129 -.071 -.208 -.300 .108 -.280 -.146 -.206 .089 83.2796 .000 - 124 407 1.000 1.4217 .000 82 .249û 1.000 -3.801 -.576 -.146 -.168 -.257 1.2632 81/82 2424. 404. 400. 200. .000 1.000 1.0000 80. .000 1.000 1. 2746 .8602 .მეე 79/80 -,296 -.085 -.201 -.269 .155 79. .064 -3.058 -985 1.000 Fishing Mortalities (F) Selection-at-age (S) 1.253 78 0.0421 .6894 1.652 ~ 44. -.496 -. 219 1.000 F-vaiues S-values S-values A998 00/17 10/17 10/11 12/13 13/14

Table 4.16 VIRTUAL POPULATION ANALYSIS from separable VPA.

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| Y COEFF | 1985 | 22.88.44.48.48.48.48.48.48.48.48.48.48.48. | .08 |
| MORTALITY COEFFICIENT | 1984 | 0044410000
1004410000000000000000000000 | .07 |
| NATURAL | 1983 | 001111222 | .06 |
| Year-1 | 1982 | 0.0001112224450044500000000000000000000000 | .05 |
| UNIT: Ye. | 1981 | 000000000000000000000000000000000000000 | .02 |
| | 1980 | 100
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| COEFFICIENT | 1979 | 00000000000000000000000000000000000000 | 90. |
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Table 4.17 VIRTUAL PUPULATIUN ANALYSIS from separable VPA.

BLUE WHITING, NORTHERN AREA

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| STOCK SIZE IN NUMBERS | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | BIOMASS TOTALS | 111111111111111111111111111111111111111 | ALL VALUES ARE GIVEN FOR 1 JANIARY |

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| 1978 | 14653 | 7 (
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7 (| 7/20 | 6356 | 5724 | 5759 | 5382 | 7000 | 2670 | 1 L
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2 C | 7302 | 2203 | 1137 | - u | 7 1 | 4/6 | 213 | 167 | | 70350 | 43182 | 7200 | 6 038 | |
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-{ , | J. | , ⊤ | 15.∻ | | TOTAL NO | 000 KO | 101.010% | EDTS SES | |

Table 4.18

œ BLUE WHITING - NORTHERN STOCK The reference F is the mean F for the age group range from 4 to

Data are printed in the following units:

Total yield and weight by age group in the catch: kilogram Total biomass and weight by age group in the stock: kilogram

| | . | | | | | | | | | _ | | _ | | | | |
|------------------------|----------|----------------|------|------|------|--------|-----------|------|------|----------|------|-----|-----|----------------|------|------|
| weight in
the stock | 100 | 056 | .092 | .109 | 125 | 148 | 178 | .209 | .221 | .222 | .251 | 249 | 252 | 274 | 242 | .266 |
| weight in
the catch | .021 | .056 | .092 | 109 | .125 | .148 | .178 | .209 | .221 | .222 | .251 | 249 | 252 | 274 | 242 | .266 |
| maturity;
ogive | 100. | 10 | .37 | .81 | .85 | .91! | .94 | 1.00 | • | | 1.00 | ٠ | | | | 1.00 |
| natural
mortality | .20 | .20 | .20 | .20 | .20 | .20! | .20 | .20 | .20 | .20 | .20 | .20 | .20 | .20 | .20 | .20 |
| fishing!
pattern! | .04 | 60. | .07 | 10 | 14. | .17 | .22 | .25 | 32 | .36 | .50 | .45 | .57 | 32 | . 25 | .25 |
| age | Ö | - 7 | 2 | m | 4 | ري
 | ر
ا در | | ω (| <u> </u> | 101 | 77 | 12 | 7 3 | 141 | 154 |

Table 4.12 VIRTUAL PUPULATION ANALYSIS from separable VPA.

BLUE WHITING, NORTHERN AREA

STOCK SIZE IN NUMBERS UNIT: millions
BIOMASS TOTALS UNIT: thousand tonnes
ALL VALUES ARE GIVEN FOR 1 JANUARY

| 1978-85 | 18320 | 13623 | 9724 | 5/5/ | 3525 | 3115 | 2777 | 2422 | 2074 | 10
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|---------|--------------------------------------|---|----------------------------|--|---------------------------------------|--|-------------------------|-------------------|---|--|---|--------------|---|----------------|--------------------|------------|-------------------|----------------|---|--------------|--------------|
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| 1987 | 24847 | ()
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| 1586 | 6
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28420 | A 000000 | 4455 |
| 1985 | 17291 | 14004
00000 | 4.74.00
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7 -
7 - | - H | 14.00
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10.00 | 27.7 | 677 | 533 | 277 | ~ C | イン・ハン・ハン・ハン・ハン・ハン・ハン・ハン・ハン・ハン・ハン・ハン・ハン・ハン | 151 | 77 | - ব
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300 | 5836 | 3458 |
| 1984 | 17666 | 2010
21635 | 1000 | | 0 €
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0 € | 1000 | 777 | 7777 | 0
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0 | 629 | かんり | - C | 7,00 | 1
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23401 | 5381 | 2639 |
| 1983 | 40871 | 37.60 | 2217 | 2525 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 7 (2) | 15000 | T . | TRAT | 774 | 476 | 270 |) (
) (| л
Ю
Н | 126 | Ο)
(0) | 81 | 1°
0
0 | 17695 | 4799 | 2583 |
| 1982 | 39426
4642 | 2807 | 3309 | 4009 | 2319 | 1978 | |) (
) (
) (| 77#2 | 892 | 615 | 380 | 0 0 | 200 | 165 | 196 | 119 | . V | 18056 | 4129 | 2979 |
| 1981 | 5669
3503 | 4176 | 5464 | 3146 | 2990 | 2581 | 2030 | 000 | 0 0 C T | 1383 | 1749 | 747 | . A. |)
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(| 321 | 201 | 125 | 35.80
808 | 23404 | 4276 | 3536 |
| 1980 | 4307 | 7389 | 4323 | 4117 | 3710 | 3089 | 3006 | のないの | V 1.000 € 1.0 | 27.05 | 2026 | Q
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Q | 824 | 7 7 6 | 377 | 295 | 23 | 44672 | 30148 | 5089
5089 | 4353 |
| 1979 | 6678
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40 | 0 | 37888 | 6247 | υ
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| 1978 | 14653 | 6872 | 6356 | 5724 | 5739 | 5382 | 5038 | 4671 | | 140
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140 | 4403 | 1137 | 765 | 777 |) (| 773
113 | 791 | 70350 | 43182 | 7200 | 8900
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-{ !, | L∵ | TOTAL NO | SPS NO | | Word of |

Table 4.18

BLUE WHITING - NORTHERN STOCK The reference F is the mean F for the age group range from 4 to 8

Data are printed in the following units:

Total yield and weight by age group in the catch: kilogram Total biomass and weight by age group in the stock: kilogram

| .20 .10 .056 .056 .056 .056 .20 .20 .37 .092 .092 .20 .81 .109 .109 .109 .20 .20 .20 .20 .20 .20 .20 .20 .20 .20 |
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Table 4.19 Catch per unit effort in the directed fisheries 1980-1987 (fishing gear - mid-water trawl).

| | | Div | ision I | Ia - t | /hour | | | | | |
|----------------|--------------------|---|--------------------------------------|------------------------------|------------------------------|------------------------------|------------------------------------|---------------------------|--------------------------------------|--------------------------------------|
| GRT class | Country | Time
period | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
| 2,000-3,999.9 | Norway | Nov | _ | - | - | - | 8.00 | 1 | _ | - |
| 1,000-1,999.9 | USSR | Apr-Oct | - | - | _ | 0.87 | · _ | 1.86 | 1.63 | 2.47 |
| 2,000-3,999.9 | German
Dem.Rep. | May-Jun
Jul-Sep
Oct-Dec | 3.11 | | 1.21 | | 2,57 | | 2.30 | 1.63
0.80
0.94 |
| ÷ . | USSR | Feb
Mar-Apr
May-Jun
Jul-Sep
Oct-Dec | 6.35
2.38
3.30
3.82
3.14 | 2.62
2.54 | 1.84
1.35
2.85
2.99 | 1.73
0.60 | | | 3.58
4.12
3.08
2.27
1.42 | 2.21
3.54
2.34
2.28
1.90 |
| 4,000 and more | USSR | Jan-Sep | | _ | - | - | - | - | 5.43 | 2.51 |
| | | Divi | sion IV | /a - t/ | hour/ | | | | | |
| 100- 499.9 | Norway | Apr-May | - | 7.18 | 17.39 | 16.51 | 8.68 | - | 2.18 | - |
| 500- 999.9 | Norway | Apr-May
Nov | 9.29 | 13.40 | 13.75 | 18.31 | 7.01 ₄ .50 ¹ | 15.70 | - | 7.91 |
| 1,000-1,999.9 | Norway | Mar
Apr-May | - | 15.36 | 15.03 | 21.19 | - | 17.26 | - | 7.93
5.27 |
| | | Div | ision V | b - t/ | hour | | | | | |
| 500- 999.9 | Faroes | May | 6.20 | 9.60 | _ | _ | _ | - | - | |
| | Norway | Jan
Apr-May
Nov-Dec | 18.14 | 18.94
- | 4.88 | -
-
- | 12.40
25.08 | 16.19 | 11.86
13.43 | -
-
- |
| 1,000-1,999.9 | German
Dem.Rep | Jan-Mar
Dec | - | -
- | - | - | <u></u> | <u>-</u> | - | 1.47
1.13 |
| | Norway | Apr-May | 13.57 | 29.47 | _ | - | - ; | 24.85 | | 13.96 |
| | USSR | Apr-Jun | - | - | _ | 0.38 | _ | 7.05 | - | _ |
| ,000-3,999.9 | German
Dem.Rep. | Jan-May
Jun-Jul
Aug
Sep-Dec
Nov-Dec | -
-
-
- | 3.88 | 2.12 | 2.08 | 2.20 | 3.50
3.58
-
1.58 | 1.40
2.50
2.10 | 0.18
1.86
0.97
0.64 |
| | USSR | Jan-Feb
Mar-May
Jul-Aug
Sep-Dec | - | 6.71
5.97
3.75
2.72 | 5.16
4.58
3.03 | 3.05
4.12
3.16
2.77 | 1.74
4.57
4.29
3.70 | 3.71
4.99
5.33 | 5.22
5.41 | 2.37
4.87
5.45
2.06 |
| ,000 and more | USSR | Feb-Oct | - | - | - | _ | _ | _ | 7.50 | 3.20 |

Table 4.19 (cont'd)

| | | Div | ision ' | VIa - | t/hour | | | | | |
|---------------|--------------------|---------------------------|------------|---------------|--------|-------------|------------------------|---------------|-------------------------|-------------------------|
| GRT class | Country | Time
period | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
| 100- 499.9 | Norway | Feb | - | - | _ | → | 31.35 | _ | _ | _ |
| 500- 999.9 | Faroes | Apr | 16,40 | - | - | - | _ | - | - | <u>-</u> |
| | Norway | Jan-Feb
Mar-Apr
May | 26.56
- | 34.96 | 36,30 | 49.04 | 25.21 | 20.05 | 11.90
21.50
22.38 | 14.84
24.78
10.62 |
| 1,000-1,999.9 | Norway | Feb
Mar-Apr
May | 23.92 | 57.1 <u>3</u> | 42.38 | 42.83 | 28.78 | 22.29 | - | 10.81
20.53
12.07 |
| 2,000-3,999.9 | USSR | Mar | - | · | - | - | 3.92 | - | - | - |
| | | Div | sion V | 'Ib - t | :/hour | | - | , | ···· | |
| 2.000-3,999,9 | German
Dem.Rep. | Mar-Apr | ** | *** | _ | - | - | - | _ | 2.49 |
| • | USSR | Apr-Jun | · — | - | - | 17 , | - | | 4.80 | 4.42 |
| | | Divis | on VII | b,c - | t/hour | | | *- = | | |
| 100- 499.9 | Norway | Mar | - | - | - | | 21.08 | _ | - | |
| 500- 999.9 | Norway | Mar-Apr | • - | - | - | -, | 27.74 | 26.83 | 25.35 | 21.74 |
| 1,000-1,999.9 | Norway | Mar
Apr
Nov | ÷
- | - |
 | - | -
8.00 ¹ | 32.08 | .
- | 24.02
38.35 |
| 2,000-3,999.9 | USSR | Feb-Mar | | - | _ | | 4.72 | 6.21 | 3.83 ² | 4.49 ² |
| ,000 and more | USSR | Feb-Mar | - | _ | _ | - | _ | | 10.20 | |
| | | Divis | ion VI |
Ig-k - | t/hou | r | | | | |
| 500- 999.9 | Norway | Mar | | <u> </u> | - | | 14.58 | | | 35.54 |
| .000-1,999.9 | Norway | Mar | - | - | - | _ | | _ | | 35.24 |
| ,000-3,999.9 | German
Dem.Rep. | Feb-Mar | - | - | - | - | - | - | 7.20 | 3.21 |
| | USSR | Feb-Mar | _ | _ | | _ | 3.85 | 12.30 | 6.96 | 4.963 |

One trawl only.
Refers to Feb-Apr.
Refers to Mar-Apr.

Table 4.19 Catch per unit effort in the directed fisheries 1980-1987 (fishing gear - mid-water trawl).

| | | Div | ision I | Ia - t | /hour | | | | | · · · · · · · · · · · · · · · · · · · |
|----------------|--------------------|---|--------------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|---------------------------|--------------------------------------|---------------------------------------|
| GRT class | Country | Time
period | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
| 2,000-3,999.9 | Norway | Nov | | - | - | - | 8.00 | 1 _ | · - | - |
| 1,000-1,999.9 | USSR | Apr-Oct | - | - | - | 0.87 | _ | 1.86 | 1.63 | 2.47 |
| 2,000-3,999.9 | German
Dem.Rep. | May-Jun
Jul-Sep
Oct-Dec | 2.79
3.11
3.51 | 2.25 | 1.00
1.21
2.25 | 2.35
1.10
2.70 | 2.57 | | 2,30 | 0.80 |
| * . | USSR | Feb
Mar-Apr
May-Jun
Jul-Sep
Oct-Dec | 6.35
2.38
3.30
3.82
3.14 | 2.62 | 1.84
1.35
2.85
2.99 | 1.73
0.60 | | 0.87
2.48
3.16 | 3.58
4.12
3.08
2.27
1.42 | 2.21
3.54
2.34
2.28
1.90 |
| 4,000 and more | USSR | Jan-Sep | | - | | - | - | - | 5.43 | 2.51 |
| | | Divi | sion I | /a - t/ | /hour | | | | | |
| 100- 499.9 | Norway | Apr-May | - | 7.18 | 17.39 | 16.51 | 8.68 | _ | 2.18 | - |
| 500- 999.9 | Norway | Apr-May
Nov | 9.29 | 13.40 | 13.75 | 18.31 | 7.01
4.50 | 15.70 | - | 7.91 |
| 1,000-1,999.9 | Norway | Mar
Apr-May | | 15.36 | 15.03 | 21.19 | - | _
17.26 | - | 7.93
5.27 |
| | | Div | ision V | /b - t/ | hour | | | | | |
| 500- 999.9 | Faroes | May | 6.20 | 9.60 | _ | - | _ | | _ | _ |
| | Norway | Jan
Apr-May
Nov-Dec | 18.14 | 18.94 | 4.88 | - | 12.40
25.08 | 16.19 | 11.86
13.43 | -
-
- |
| ,000-1,999.9 | German
Dem.Rep | Jan-Mar
Dec | - | - | | - | <u></u> | - | - | 1.47
1.13 |
| | Norway | Apr-May | 13.57 | 29.47 | - | - | - : | 24.85 | - | 13.96 |
| | USSR | Apr-Jun | - | - | - | 0.38 | _ | 7.05 | - | _ |
| ,000-3,999.9 | German
Dem.Rep. | Jan-May
Jun-Jul
Aug
Sep-Dec
Nov-Dec | - | 3.88 | 2.12 | 2.08 | 2.20 | 3.50
3.58
-
1.58 | 1.40
2.50
2.10 | 0.18
1.86
0.97
0.64 |
| | USSR | Jan-Feb
Mar-May
Jul-Aug
Sep-Dec | 6.83
5.23 | 6.71
5.97
3.75
2.72 | 5.16
4.58
3.03 | 3.05
4.12
3.16
2.77 | 1.74
4.57
4.29
3.70 | 3.71
4.99
5.33 | 3.12
5.22
5.41
3.27 | 2.37
4.87
5.45
2.06 |
| ,000 and more | USSR | Feb-Oct | - | - | - | - | _ | _ | 7.50 | 3.20 |

Table 4.19 (cont'd)

| | | Div | ision | VIa - | t/hour | | | | | |
|----------------|--------------------|---------------------------|-------------------|--------------|---------------|-------------|-------------------|--|---------------------------|-------------------------|
| GRT class | Country | Time
period | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
| 100- 499.9 | Norway | Feb | - | - | - | _ | 31.35 | - | · - | - |
| 500- 999.9 | Faroes | Apr | 16,40 | | | _ | _ | - | - | - |
| | Norway | Jan-Feb
Mar-Apr
May | 26.5 ₆ | 34.96 | 36.3 <u>0</u> | 49.04 | 25.21 | 20.05 | 11.90
21.50
22.38 | 14.84
24.78
10.62 |
| 1,000-1,999.9 | Norway | Feb
Mar-Apr
May | 23.92 | 57.13 | 42.38 | 42,83 | 28.78 | 22.29 | - | 10.81
20.53
12.07 |
| 2,000-3,999.9 | USSR | Mar | - | • - | - | - | 3.92 | - | | - |
| | | Divi | sion V | /Ib - t | /hour | | | · , · · · | | |
| 2.000-3,999,9 | German
Dem.Rep. | Mar-Apr | - | - | *** | - | - | | - | 2.49 |
| | USSR | Apr-Jun | . | - | - | ₹. | ! | - | 4.80 | 4.42 |
| | | Divis | on VII | b,c - | t/hour | | | ······································ | · · · · · · · · · · · · · | |
| 100- 499.9 | Norway | Mar | | - | | _ | 21.08 | · | - | |
| 500- 999.9 | Norway | Mar-Apr | · - | = | - | - . | 27.74 | 26.83 | 25.35 | 21.74 |
| 1,000-1,999.9 | Norway | Mar
Apr
Nov | -
-
~ | - | -
- | - | 8.00 ¹ | _
32.08 | -
- | 24.02
38.35 |
| 2,000-3,999.9 | USSR | Feb-Mar | - | - | - | _ | 4.72 | 6.21 | 3.83 ² | 4.492 |
| 1,000 and more | USSR | Feb-Mar | | - | ~ | _ | _ | _ | 10.20 | _ |
| | | Divis | ion VII |
Ig−k - | t/hou | | | • | | |
| 500- 999.9 | Norway | Mar | | | - | | 14.58 | - | _ | 35.54 |
| .000-1,999.9 | Norway | Mar | - | - | - | | _ | _ | - | 35.24 |
| ,000-3,999.9 | German
Dem.Rep. | Feb-Mar | - | - | - | - | - | - | 7.20 | 3.21 |
| | USSR | Feb-Mar | _ | _ | _ | _ | 3.85 | 12.30 | 6.96 | 4.963 |

One trawl only.
Refers to Feb-Apr.
Refers to Mar-Apr.

Table 4.20 Catch per unit effort in the BLUE WHITING directed fisheries in Division IIa for 2,000 - 3,999.9 GRT, using mid-water trawls, 1980-1987.

| Month | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|-----------------|--------------|----------------|----------------|----------------|----------------|--------------|--------------|--------------|
| | | | , | Catch (| tonnes) | | | |
| German Dem.Rep. | | | - <u> </u> | | | | | - |
| January | | - | - | | _ | | - | - |
| February | - | - | _ | - | _ | - | - | - |
| March | - | - | | ~ | - | - | - | - |
| April | E A C | 450 | 200 | -
- | - | - | _ | - |
| May
June | 546
3,025 | 159
2,566 | 289 | 613 | 351 | 202 | 450 | 400 |
| July | 3,523 | 5,951 | 1,148
1,226 | 2,524
1,026 | 1,876
3,947 | 393 -
642 | 150 | 432 |
| August | 2,871 | 4,130 | 1,220 | 764 | 1,779 | 042 | 1,441 | 111
70 |
| September | 605 | 1,481 | 113 | 704 | 240 | 490 | 1,335 | 139 |
| October | 1,128 | 55 | 266 | _ | 240 | 111 | 403 | 258 |
| November | 1,380 | - | 200 | 494 | | | 412 | 250 |
| December | 754 | - | - | 132 | - | - | 712 | - |
| All months | 13,832 | 14,310 | 3,042 | 5,553 | 8,193 | 1,636 | 3,741 | 1,010 |
| May - Oct | 11,698 | 14,310 | 3,042 | 4,917 | 8,193 | 1,636 | 3,179 | 1,010 |
| | | | | Effort | (hours) | | | |
| January | | _ | - | - | _ | _ | <u></u> | |
| February | - | | _ | - | . – | - | | - |
| March | - | - | - | - | - | - | - | - |
| April | - | | - | | _ | - | | |
| May | 279 | 210 | 152 | 393 | 219 | - | - | ~ |
| June
July | 999
902 | 2,046 | 1,280 | 945 | 1,371 | 153 | 28 | 265 |
| lugust | 965 | 2,596
2,079 | 1,045 | 831 | 1,596 | 247 | -
- | 163 |
| September | 248 | 627 | 54 | 801 | 598
128 | 242 | 563 | 60 |
| october | - | 53 | 118 | | 120 | 247
91 | 546
192 | 175
274 |
| November | _ | - | - 110 | _ | _ | <i>3</i> 1 | 115 | 2/4 |
| ecember | - | - | _ | - | _ | - | - | - |
| all months | 4,322 | 7,611 | 2,649 | 3,202 | 3,912 | 738 | 1,444 | 937 |
| lay - Oct | 3,817 | 7,611 | 2,649 | 2,970 | 3,912 | · 738 | 1,301 | 937 |
| | | | CP | UE (tonn | es/hour) | | | |
| anuary | _ | _ | _ | _ | _ | - | _ | |
| ebruary | - | - | - | - | - | - | - | - |
| arch | - | - | - | - | - | _ | - | |
| pril | 4 06 | A 7.6 | - | - | | - | - | - |
| ay | 1.96 | 0.76 | 1.90 | 1.56 | 1.60 | | _ | - |
| une
uly | 3.03
3.91 | 1.25
2.29 | 0.90
1.17 | 2.67 | 1.37 | 2.57 | 5.36 | 1.63 |
| ugust | 2.98 | 1.99 | 1.17 | 1.24
0.95 | 2.47
2.97 | 2.60 | 2 5 6 | 0.68 |
| eptember | 2.44 | 2.36 | 2.09 | 0.35 | 1.88 | 1.98 | 2.56
2.45 | 1.17
0.79 |
| ctober | - | 1.04 | 2.25 | _ | 1.00 | 1.22 | 2.10 | 0.73 |
| ovember | - | - | - | | _ | - | 3.58 | 0.74 |
| ecember | - | - | - | - | - | - | - | - |
| ll months | 3.20 | 1.88 | 1.15 | 1.73 | 2.09 | 2.22 | 2.59 | 1.08 |
| ay - Oct | 3.06 | 1.88 | 1.15 | 1.66 | 2.09 | 2.22 | 2.51 | 1.08 |

Table 4.20 (cont'd)

| Month | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|--|--|--|----------------------------------|--------------------------|----------------------------------|-----------------------------------|--|---|
| | | | | Catch | (tonnes) | | | |
| <u>ussr</u> | | | | | | | | |
| January
February
March | 2,927
2,153
16,811 | - | 8,003
375 | <u>-</u> | -
- | <u>-</u> | 1,069
3,622 | 2,42 |
| April
May
June
July | 36,284
125,988
114,117
121,463 | 45,645
88,754
78,727 | 618
46,089
27,617
6,820 | 15,188
7,919
1,172 | 1,782
6,131
16,564 | 3,289
25,031 | 455
27,967 | 1,48
9,18
5,10
31,83 |
| August
September
October
November | 114,505
79,504
50,954
17,543 | 63,889
37,960
11,560 | 2,921
1,121
379 | - | 11,842
15,609
492 | 33,177
20,969
5,311 | 47,485
32,608
9,269
1,812 | 34,02
23,59
6,25
2,94 |
| December | 1,292 | 10,704 | 3/3 | | | _ | 966
268 | |
| All months | 683,541 | 433,485 | 93,943 | 24,279 | 52,420 | 87,839 | 126,520 | 111,995 |
| May - Oct | 606,531 | 368,472 | 84,568 | 24,279 | 50,638 | 87,777 | 119,596 | 103,753 |
| · | | | <u> </u> | Effort | (hours) | | | |
| January
February
March
April | 339
6,151
16,119 | 1,208
12,666 | 1,045
-
285
256 | -
-
- | 222 | -
-
-
68 | 622
1,013
135 | 1,093 |
| May
June
July
August | 25,244
47,634
42,319
28,293 | 25,912
37,919
39,039
29,528 | 17,106
14,209
5,983 | 7,300
6,094
1,963 | 2,247
5,160
4,315
5,292 | 1,900
9,550
11,600
7,350 | 119
160
8,616
16,490
16,014 | 2,578
2,001
13,790
14,734
9,526 |
| September
October
November
December | 17,499
16,072
5,710
413 | 11,745
3,270
1,455
4,263 | 640
341
161
- | -
-
-
- | 194 | 2,360 | 5,252
1,579
544
255 | 3,087
1,581 |
| All months | 206,372 | 167,005 | 40,026 | 15,357 | 17,430 | 32,828 | 50,799 | 48,827 |
| May - Oct | 177,061 | 147,413 | 38,279 | 15,357 | 17,208 | 32,760 | 48,111 | 44,719 |
| | | | C | PUE (toni | nes/hour |) | | |
| January
February | 6.35 | | 7.66 | - | - | <u>-</u> | 1.72
3.58 | |
| March
April
May
Tune | 2.73
2.25
4.99
2.39 | 3.22
3.60
3.42
2.08 | 1.32
2.41
2.69
1.94 | 2.08
1.30 | 8.01
2.73
3.21 | 0.91
1.56
2.62 | 3.43
4.44
2.84
3.25 | 2.22
3.40
3.57
2.55
2.31 |
| uly
ugust
eptember
ctober
ovember
ecember | 2.87
4.05
4.54
3.17
3.07
3.13 | 2.24
2.16
3.23
3.53
3.28
2.51 | 1.14
4.56
3.29
2.35 | 0.60 | 2.74
2.95
2.54
- | 2.86
2.84
2.25 | 2.88
2.04
1.77
1.15
1.78
1.05 | 2.31
2.50
2.03
1.86 |
| 11 months | 3.31 | 2.60 | 2.35 | 1.58 | 3.01 | 2.68 | 2.49 | 2.29 |
| ay - Oct (1) | 3.43
3.14 | 2.50
3.67 | 2.21 | 1.58 | 2.94
1.33 | 2.68 | 2.49
2.17 | 2.32 |

 ⁽¹⁾ CPUE = total catch/total effort.
 (2) CPUE = Ε(monthly CPUE)/no. of months.

Table 4.20 Catch per unit effort in the BLUE WHITING directed fisheries in Division IIa for 2,000 - 3,999.9 GRT, using mid-water trawls, 1980-1987.

| Month | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|--|--|---|--------------------------------------|---|---------------------------------------|------------------------------|---|--------------------------------------|
| | | | | Catch (| (tonnes) | | | |
| German Dem.Rep. | - | | | | | | | |
| January
February
March
April | -
-
- | -
-
- |

 |

 | -
-
- | -
-
- | - |
 |
| May
June
July
August
September
October
November
December | 546
3,025
3,523
2,871
605
1,128
1,380
754 | 159
2,566
5,951
4,130
1,481
55 | 289
1,148
1,226
113
266 | 613
2,524
1,026
764
-
494
132 | 351
1,876
3,947
1,779
240 | 393
642
490
111 | 1,441
1,335
403
412 | 432
111
70
139
258 |
| All months | 13,832 | 14,310 | 3,042 | 5,553 | 8,193 | 1,636 | 3,741 | 1,010 |
| May - Oct | 11,698 | 14,310 | 3,042 | 4,917 | 8,193 | 1,636 | 3,179 | 1,010 |
| | | | | Effort | (hours) | | | |
| January
February
March | -
-
- | -
-
- | - | - | - | -
- | | -
-
- |
| April
May
June
July
August
September
October
November
December | 279
999
902
965
248 | 210
2,046
2,596
2,079
627
53 | 152
1,280
1,045
54
118 | 393
945
831
801
- | 219
1,371
1,596
598
128 | 153
247
247
91 | 28
563
546
192
115 | 265
163
60
175
274 |
| All months | 4,322 | 7,611 | 2,649 | 3,202 | 3,912 | 738 | 1,444 | 937 |
| lay - Oct | 3,817 | 7,611 | 2,649 | 2,970 | 3,912 | 738 | 1,301 | 937 |
| | , | | CP | UE (tonn | es/hour) | | , | * |
| January
Jebruary
Jarch
Jeril | - | -
-
- | - | - | -
-
- | | -
-
- | -
-
- |
| lay
une
uly
ugust
eptember
ctober
ovember
ecember | 1.96
3.03
3.91
2.98
2.44 | 0.76
1.25
2.29
1.99
2.36
1.04 | 1.90
0.90
1.17
2.09
2.25 | 1.56
2.67
1.24
0.95 | 1.60
1.37
2.47
2.97
1.88 | 2.57
2.60
1.98
1.22 | 5.36
-
2.56
2.45
2.10
3.58 | 1.63
0.68
1.17
0.79
0.94 |
| ll months | 3.20 | 1.88 | 1.15 | 1.73 | 2.09 | 2.22 | 2.59 | 1.08 |
| ay - Oct | 3.06
2.83 | 1.88
1.62 | 1.15
1.66 | 1.66
1.61 | 2.09 | 2.22 | 2.51
3.12 | 1.08 |
| | | | | | _ · · • | | | |

Table 4.20 (cont'd)

| Month | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|--|--|--------------------------|---|--|---|---|
| | | | | Catch | (tonnes) | | | |
| <u>USSR</u> | | | | | | | | |
| January February March April May June July August September October November December | 2,927
2,153
16,811
36,284
125,988
114,117
121,463
114,505
79,504
50,954
17,543
1,292 | 3,886
45,645
88,754
78,727
87,589
37,960
11,560
4,778 | 8,003
375
618
46,089
27,617
6,820
2,921
1,121
379 | 15,188
7,919
1,172 | 1,782
6,131
16,564
11,842
15,609
492 | 62
3,289
25,031
33,177
20,969
5,311 | 1,069
3,622
463
529
455
27,967
47,485
32,608
9,269
1,812
966
268 | 2,42:
1,48:
9,18:
31,83:
34,02:
23,594
6,256
2,944 |
| All months | 683,541 | 433,485 | 93,943 | 24,279 | 52,420 | 87,839 | 126,520 | 111,995 |
| May - Oct | 606,531 | 368,472 | 84,568 | 24,279 | 50,638 | 87,777 | 119,596 | 103,753 |
| | | | | Effort | (hours) | | | |
| January February March April May June July August September October November | 339
6,151
16,119
25,244
47,634
42,319
28,293
17,499
16,072
5,710
413 | 1,208
12,666
25,912
37,919
39,039
29,528
11,745
3,270
1,455
4,263 | 1,045
285
256
17,106
14,209
5,983
-
640
341
161 | 7,300
6,094
1,963 | 222
2,247
5,160
4,315
5,292
194 | 68
1,900
9,550
11,600
7,350
2,360 | 622
1,013
135
119
160
8,616
16,490
16,014
5,252
1,579
544
255 | 1,093
437
2,578
2,001
13,790
14,734
9,526
3,087
1,581 |
| All months | 206,372 | 167,005 | 40,026 | 15,357 | 17,430 | 32,828 | 50,799 | 48,827 |
| May - Oct | 177,061 | 147,413 | 38,279 | 15,357 | 17,208 | 32,760 | 48,111 | 44,719 |
| | ···· | | CI | PUE (toni | nes/hour |) | | |
| January Jarch Jarch Jay June July Jugust July July July July July July July July | 6.35
2.73
2.25
4.99
2.39
2.87
4.05
4.54
3.17
3.07
3.13 | 3.22
3.60
3.42
2.08
2.24
2.16
3.23
3.53
3.53 | 7.66
1.32
2.41
2.69
1.94
1.14
4.56
3.29
2.35 | 2.08 1.30 0.60 | 8.01
2.73
3.21
2.74
2.95
2.54 | 0.91
1.56
2.62
2.86
2.84
2.25 | 1.72
3.58
3.43
4.44
2.84
3.25
2.88
2.04
1.77
1.15
1.78 | 2.22
3.40
3.57
2.55
2.31
2.50
2.03
1.86 |
| ll months | 3.31 | 2.60 | 2,35 | 1.58 | 3.01 | 2.68 | 2.49 | 2.29 |
| ay - Oct (1)
(2) | 3.43
3.14 | 2.50
3.67 | 2.21
2.78 | 1.58
2.72 | 2.94
1.33 | 2.68
2.83 | 2.49
2.17 | 2.32 2.26 |

 ⁽¹⁾ CPUE = total catch/total effort.
 (2) CPUE = Σ(monthly CPUE)/no. of months.

Table 4.21

. .

BLUE WHITING - NORTHERN STOCK

The reference F is the mean F for the age group range from 4 to 8

The number of recruits per year is as follows:

Year Recruitment 1988 11000.0 1989 11000.0 Data are printed in the following units:

Number of fish:
Weight by age group in the catch: kilogram
Weight by age group in the stock: kilogram
Stock biomass:
Catch weight:

| 1111 | + | + | | 1 | | • |
|-------------|------------|------------|---|---------------------|---------------------|---------------------|
| 900 | stock size | fishing | natural
mortality | maturity;
ogive; | weight in the catch | weight in the stock |
| 0 | 11000.0 | .04 | 100 | ·+1111111111 | + | +1111111111 |
| | 8653.0 | 0 | | 000 | T70. | .UZI |
| - | 0.0000 | , , | 107 | 01 | 950. | .056 |
|
 | | · · | 107. | .37 | .092 | .092 |
| n . | SUISTO | .10 | .20 | .81 | 1001. | 1001 |
| · | 60.26.0 | 14 | .20 | 1000 | 125 | - 100 |
| <u>.</u> | 9907.0 | | 200 | 1 10 | 0 0 0 | 7 (4) |
| <u>.</u> | המתו הי | 000 | 2 0 | | 0 | . L43. |
| | | 777 | , UZ. | - 4.V. | 178 | 1781 |
| ~ (| | 57. | .20 | 1.00 | 200 | 200 |
| | | .32 | .20 | 1 UU 1 | 200 | |
| <u></u> | | | 100 | 1 | 1477. | ! T77. |
| - | 1 10 | • | 107. | 100.1 | .222 | .222; |
|
O ; | 0.007 | nc. | .20 | 1.00 | .251 | . 251 |
| -
- | | . 55 | .20 | 1,00 | 10176 | 1000 |
| 12: | | F.7. | | 1 4 | | 647 |
| | | ~ (
} (| 107· | T.00.1 | . 252 | . 252 |
| ٠.
ا | | .32 | .20 | 1.00 | .274 | 274 |
| 74 | | .25 | . 20 | 1,001 | 2/12 | |
| | S. C. | r
u | 100 | 7 4 | 77.7 | 1747 |
| · · · | 3 | . 62 | . VU | 1.00 | .286 | .266 |
| | + | +1111111 | +====================================== | | | • |

Table 4.22

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

BLUE WHITING - NORTHERN STOCK

| + | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ |] | Year 1988 | 88 | | | | Year 1989 | 6 | +
1
1
1 | Year | Year 1990 |
|------------|---------------------------------------|------------|----------------|---------------------|-----------------|----------------|----------|--------------------|----------------------|------------------|-------|-----------|
| fac | fac- ref.
tor F | . H. I | sto
ioma | sp.stock
biomass | catch | fac- | ref. | stock!
biomass! | sp.stock
biomass | catch | stock | sp.stock |
| | <u>α</u> , | .17 | 5831 | 4314 | 1009 | 1 | 100. | 5640 | 4235 | | 6026 | 4634 |
| | - | ~ - | | | | r-[(| .02 | | | 82 | 5936 | 4552 |
| | | | | | | 7 | 40. | | | 169 | 5848 | 4472 |
| | | | | | | - (| 25. | | | 330 | 5676 | 4318 |
| | | - - | - - | | | ٥٠ | 13 | | | 486 | 5511 | 4169 |
| · | | | | · - - | | Σ. | 7. | | | 631 | 5358 | 4032 |
| - - | | | | - | | φ, | 8 | | | 636 | 5352 | 4027 |
| | | | | • | |) · | .22 | | | 780 | 5200 | 3890 |
| | | | | | | 7.7 | .76 | - | | 918 | 5053 | 3759 |
| | | | | • | - - | , | بر
ال | - | | 1052 | 4912 | 3633 |
| | - - | | | | | 1.6 | 35 | | | 1180 | 4776 | 3512 |
| | | | | | | 1.8 | .40 | | - | 1303 | 4645 | 3306 |
| - ÷ | | | | | | 2.0 | .44 | | | 1422 | 4518 | 3284 |
| The d | The data unit of | 4 | of the biomass | ו ה
ה | + | , | 1000 +0: | + | +111111111111 | ,+ | | + |
| i | | | | ; | 100 | מ
כ | | 0000 | | | | |

nee data unit of the blomass and the catch is 1000 tonnes. The spawning stock biomass is given for 1 January. The reference F is the mean F for the age group range from 4 to

œ

Table 4.21

 ∞ 4 to BLUE WHITING - NORTHERN STOCK The reference F is the mean F for the age group range from

The number of recruits per year is as follows:

| Recruitment | good glob carbs come come also date from force some also | 11000.0 | 11000.0 | 11000.0 |
|-------------|--|---------|---------|---------|
| Year | 1 | 1988 | 1989 | 1990 |

Data are printed in the following units:

Number of fish:
Weight by age group in the catch: kilogram
Weight by age group in the stock: kilogram
Stock biomass:
Catch weight:

| • | weight in;
the stock; | + | 024 | 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | 1000 | 760. | 1001. | 125! | | 011. | 178 | 1000 | 1 6 | 1777 | .222! | 2年11 | 1 7 7 | 749 | シボシー | 1201 | 7/7 | 242 | מעע | . 4001 |
|---|--------------------------|--------------|----------|---|--------|--------------|-------|--------|------------|------|------|-------|-------------|-------|---------------------------------------|-------|-------|--------|-------|------|--------|-------|-------|---------------------|
| | weight in
the catch | + | .021! | | | .074. | 100 | .125 | 1401 | 7 | .178 | . 209 | 1 200 | 1777. | .222 | 251 | 1 (| ・ ベキン・ | . 252 | | 1 6/7. | .242; | 286 | |
| 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | maturity
ogive | + | 00. | 101 | 100 | 7 | | .85 | 0,10 | | . V. | 1.00! | | | 1.00 | 1.00 | , C | 00.4 | 1.00 | | | 1.00 | 1.00 | |
| **** | natural
mortality | * | . 20 | .20 | 200 | | 107. | .20 | 102. | 100 | 2. | .20 | 201 | 2 0 | | .20 | 20. | - 2 | .20 | 100 | | .20 | .20 | |
| +1111111 | fishing | | .04 | 60. | .07 | | OT. | 14 | 17 | 200 | 777 | .25 | .32 | 1 0 | 07 | .50 | 127 |) f | 70. | 321 | 1 1 | 67. | 25 | + 1 1 1 1 1 1 1 1 1 |
| + | stock size | | in nontr | 8653.0 | 6475.0 | \$010
010 | 0.000 | 0.0200 | 9907.0 | 1007 | | 240.0 | 291.0; | 0/0 | 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | 0.007 | | • | :n•/n | | • | U.CZ | 50.09 | + |
| ++ | age | | · - · | | 5 | | | - · | <u>.</u> . | VC | 7 (| | | - | | חדם: | | - 22 | 1 777 |
 | 7 | | +CT | ++ |

Iable 4.22

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

BLUE WHITING - NORTHERN STOCK

| Year 1990 | sp.stock | 4634 | 4472 | 4318 | 4169 | 4032 | 4027 | 3890 | 3759 | 3633 | 3512 | 3396 | 3284 | + |
|-----------|--------------------------|------|------|----------------|-----------|------|------|---------|------|-------------|------------|------|------|---|
| 1 | st.
biom | 6026 | 5848 | 5676 | 5511 | 5358 | 5352 | 5200 | 5053 | 4912 | 4776 | 4645 | 4518 | - |
| † | catch | 0 10 | 169 | 330 | 486 | 631 | 636 | 780 | 918 | 1052 | 1180 | 1303 | 1422 | + |
| 6 | sp.stock! | 4235 | | | ** | | | | | | | | | + |
| Year 1989 | stock;
biomass; | 5640 | | | | | | | | | - | | | ·+ |
| | ref. | .00 | .04 | 20.00 | n i | · · | Σ. | 77. | 97. | , S. | S. | .40 | 44 | 000 |
| | fac- | 0.4 | ~ ~ | - (| o c | o c | φ, |
⊃ c | 7.7 | ₹ \
-f ₹ | 0.0 | × • | 7.0 | |
| | catch | 909 | | | | | | | | | | | | the cat |
| က | sp.stock
biomass | 4314 | | | | | | | | | | | | the biomass and the catch is 1000 towns |
| Year 1988 | stock;
biomass; | 5831 | | | | | | | | | - - | | | |
| 1 | ref. | .17 | | | - | | | | | ~ ~ . | • | | - + | unit c |
| Ye + | fac- ref.
tor F b | Φ. | ~ | | | • | | | | | . | | | The data unit of |

The gata unit of the Diomass and the catch is 1000 tonnes. The spawning stock biomass is given for 1 January. The reference F is the mean F for the age group range from 4 to

ထ

Table 4.23

Results

09.41.36 18 OCTOBER 1988 BLUE WHITING - NORTHERN STOCK

* Year 1988. F-factor .793 and reference F .1744 *

* Run depending on a TAC value *

| | | | | | | | £ | |
|---|---|--|---|--------------------|--|--|---|--|
| . 4 | | | + | | | | at | 1 January |
| 1 1 1 | age: | absolute
F | catch in
 numbers | catch in
weight | | | | sp.stock
 biomass |
| . #1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1- | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 + 1 | .0317
.0713
.0555
.0785
.1086
.1379
.1720
.2005
.2528
.2845
.3923
.3575
.4478
.2513
.2005
.2005 | 540.60
317.03
549.15
563.01
1159.40
856.17
90.22
59.17
56.15
75.79
26.58
18.79
6.67
4.13 | 30.274
29.166 | 8653.0
6475.0
8018.0
6026.0
9907.0
5961.0 | 484.57
595.70
873.96
753.25
1466.24
1061.06
114.11
64.31
55.28 | 865.3
2395.8
6494.6
5122.1
9015.4
5603.3
546.0
291.0 | 48.46
220.41
707.91
640.26
1334.27
997.39
114.11
64.31
55.28
64.26
24.15 |
| +-
 -
 - | Total |
 | 4642.41 | 600.000¦ | 57644.0; | 5830.64 | 31100.4 | |

cont'd.

Table 4.23

contid.

* Year 1989. F-factor 1.000 and reference F .2200 *

| | | | | | | 4 | · | + |
|-----|-------|--------|----------|----------|---------|---------|----------|------------|
| | | | | | | ! | at | 1 January; |
| + | + | | · | + | | | + | |
| į | | | catch in | catch in | stock; | stock | sp.stock | sp.stock¦ |
| į | age { | F | numbers | weight! | size | biomass | size | biomass |
| | 0! | .0400 | 391.18 | 8.215 | 11000.0 | 231.00 | .0 | 100. |
| į | 1 | .0900 | | | | | | |
| 1 | 2 | .0700 | | | | | | |
| į | 3; | .0990 | | | | | | |
| j | 4; | .1370 | | | 6069.2 | | | |
| í | 5 | .1740; | | | 4426.0 | | | |
| - | 6 | .2170 | | , | 7066.21 | | | |
| 1 | 7 | 2530 | | 174.731 | 4109.3 | | | |
| ţ | 8 | .3190 | | 20.118 | | | | |
| 1 | 9¦ | .3590; | | | 365.8; | | | |
| į | 10 | | , | 11.296 | 185.0¦ | 41.08; | | |
| ľ | | .4950¦ | | 13.735 | 153.4 | 38.50{ | | - 1 |
| Ţ | 11; | .4510 | | 11.685 | | 35.25 | | |
| į | 12; | .5650¦ | ., | 5.528 | 55.5 | 14.00 | , | |
| į | 13. | .3170 | | 2.023[| | 8.17 | | |
| į | 14 | | | 1.035 | 21.0 | 5.09; | | 5.09 |
| 1 | 15+; | .2530 | 10.22 | 2,719 | 50.2 | 13.37 | 50.2 | 13.37 |
| 1 1 | Total | ! | 5632.28 | 779.772¦ | 54010.0 | 5639.76 | 28316.0; | 4234.59 |

* Year 1990. F-factor 1.000 and reference F .2200 *

| | | | | | + | | + |
|------|-----------|----------|----------|----------|---------|----------|------------|
| + | tt | + | | | | at | 1 January¦ |
| | absolute¦ | catch in | catch in | stock | stock: | sp.stock | sp.stock¦ |
| age | F | numbers: | weight | size | biomass | size¦ | biomass; |
| 1 0 | .0400 | 391.18 | 8.215 | 11000.0 | 231.00 | .0; | .00 |
| 1; | .0900 | 676.01 | 37.857 | 8652.9¦ | 484.56 | 865.3 | 48.46 |
| 1 2 | | 400.50 | 36.846 | 6528.6¦ | 600.63 | 2415.6 | |
| 3; | | 430.92 | 46.970 | 5035.8 | 548.90 | 4079.0 | 444.61 |
| 4 ! | | 432.54 | 54.068; | 3719.0 | 464.88 | 3161.2 | 395,15 |
| 1 5! | .1740; | 628.98¦ | 93.089 | 4332.8 | 641.26 | 3942.9 | 583.55 |
| 6 | .2170¦ | 540.30 | 96.174; | 3045.0 | 542.01 | 2862.3 | 509.49 |
| 1 71 | | 947.43 | 198.013 | 4656.8 | 973.27 | 4656.8 | 973.27 |
| } 8¦ | .3190¦ | 650.10¦ | 143.673 | 2612.3 | 577.33 | 2612.3 | 577.33 |
| 9 | .3590 | 59.87 | 13.291 | 217.7 | 48.33 | 217.7 | 48.33 |
| 10; | .4950¦ | 37.74 | 9.474 | 105.8 | 26.55 | 105.8 | 26.55 |
| 11 (| .4510¦ | 25.37 | 6,318 | 76.5 | | 76.5 | 19.06 |
| 12 | .5650 | 29,16 | 7.347 | 73.8 | 18.61 | 73.8 | 18.61 |
| 13 | .3170 | 6.40 | 1.753 | 25.8 | 7.08 | | 7.08 |
| 14 | .2530 | 3.62 | .876 | 17.8 | • | 17.8 | 4.30 |
| 15+ | .2530 | 9,22 | 2.452 | 45.3 | 12.05 | | 12.05 |
| Tota | 1 | 5269.34 | 756.414 | 50146.1; | 5199.82 | 25158.2 | 3890.06 |

Table 4.23

Results

09.41.36 18 OCTOBER 1988 BLUE WHITING - NORTHERN STOCK

* Year 1988. F-factor .793 and reference F .1744 *

* Run depending on a TAC value *

| | | | | | | | + | + |
|-----|---|--|---|----------------------|------------------|---|--|--|
| | 1 + | | + | | | | at | 1 January |
| | age: | absolute
F | catch in | catch in¦
Weight¦ | stock
size | stock
biomass | sp.stock
size | sp.stock
 biomass |
| | 0;
12;
3;
4;
5;
6;
7;
8;
9;
10;
11;
12;
13;
14;
15; | .0317
.0713
.0555
.0785
.1086
.1379
.1720
.2005
.2528
.2845
.3923
.3575
.4478
.2513
.2005
.2005 | 540.60
317.03
549.15
563.01
1159.40
856.17
90.22
59.17
56.15
75.79
26.58
18.79
6.67
4.13 | | 8653.0
6475.0 | 484.57
595.70
873.96
753.25
1466.24
1061.06
114.11
64.31
55.28
64.26
24.15
14.36
9.04
6.05 | 865.3
2395.8
6494.6
5122.1
9015.4
5603.3
546.0
291.0
256.0
97.0
57.0
33.0
25.0 | 220.41
707.91
640.26
1334.27
997.39
114.11
64.31
55.28
64.26
24.15
14.36
9.04
6.05 |
| + + | Total | ++

 | 4642.41 | 600,000 | 57644.0 | 5830.64 | 31100.4 | 4313.58 |

contid.

Table 4.23

cont'd.

* Year 1989. F-factor 1.000 and reference F .2200 *

| | | | | | | 4 | | |
|--------------|--|--|---|--|--|--|---|---|
| _ | + 4 | | | | | | at | 1 January! |
| 1 |
 age¦ | | | catch in
Weight | | | sp.stock
size | sp.stock¦
biomass¦ |
| . 1811111111 | 0
1
2
3
4
5
6
7
8
9
10
11
12
13,
14
15+ | .0400
.0900
.0700
.0990
.1370
.1740
.2170
.2530
.3190
.4950
.4510
.5650
.3170
.2530 | 681.64
404.68
429.15
705.87
642.50
1253.83
836.03
91.03
50.88 | 38.172
37.231
46.777
88.234
95.091
223.182
174.731
20.118 | 8725.0
6596.7
5015.2
6069.2
4426.0
7066.2
4109.3
365.8
185.0
153.4
141.6
55.5 | 488.60
606.90
546.65
758.65
655.05
1257.79
858.84
80.84 | 872.5;
2440.8;
4062.3;
5158.8; | 48.86
224.55;
442.79;
644.85;
596.09;
1182.32;
858.84;
41.08;
38.50;
35.25;
14.00;
8.17; |
| + + + | Total | · | 5632.28 | 779.772 | 54010.0 | 5639.76 | 28316.0 | 4234.59 |

* Year 1990. F-factor 1.000 and reference F .2200 *

| | | | | | 4 | | + |
|--|---|--|----------------------------|--|--|---|------------|
| | | | | | !
! | at | 1 January; |
| age | absolute¦
F¦ | catch in
numbers; | catch in
weight | stock
size | | sp.stock¦
size¦ | |
| 0
11
2
3
3
4
4
5
6
7
7
1
10
11
11
12
12
13
14
15+ | .0400
.0900
.0700
.0990
.1370
.1740
.2170
.2530
.3190
.4510
.4510
.5650
.3170
.2530
.2530 | 676.01
400.50
430.92
432.54
628.98 | 37.857
36.846
46.970 | 8652.9
6528.6
5035.8
3719.0
4332.8
3045.0
4656.8
2612.3
217.7
105.8 | 484.56
600.63
548.90
464.88
641.26
542.01
973.27
577.33
48.33
26.55 | 865.3
2415.6
4079.0
3161.2
3942.9
2862.3
4656.8
2612.3
217.7
105.8
76.5
73.8
25.8
17.8 | |
| ++-
 Total
+ | | 5269.34¦ | | | 5199.82 | +- | |

Table 5.1 Landings (tonnes) of BLUE WHITING from the southern areas (Sub-areas VIII and IX and Divisions VIIg-k and VIId,e and since 1984, the Divisions VIIg-k are not included), 1978-1987, as estimated by the Working Group.

| Country | 1978 | 1979 | 1980 | 1981 | 1982 |
|--------------------|--------|----------------|------------|--------|--------|
| Germany, Fed.Rep | 25 | - - | - | | |
| Ireland | _ | 1 | - | _ | - |
| Netherlands | 7 | | 31 | 633 | 200 |
| Poland | 53 | - | _ | _ | |
| Portugal | 2,381 | 2,096 | 6,051 | 7,387 | 3,890 |
| Spain ² | 31,428 | 25,016 | 23,862 | 30,728 | 27,500 |
| UK (Scotland) | - | 63 | · <u>-</u> | | , |
| USSR | 4 | _ | - | - | _ |
| Total | 33,898 | 27,176 | 29,944 | 38,748 | 31,590 |

| Country | 1983 | 1984 | 1985 | 1986 | 1987 |
|--------------------|--------|--------|----------|-------------|--------|
| Germany, Fed.Rep. | 50 | - | → | | |
| Ireland | | - | - | ⊷ | _ |
| Netherlands | _ | - | - | - | _ |
| Norway | _ | _ | _ | - | 4 |
| Poland | - | | _ | - | _ |
| Portugal | 4,748 | 5,252 | 6,989 | 8,116 | 9,148 |
| Spain ² | 26,037 | 25,921 | 35,828 | 24,965 | 23.644 |
| UK (Scotland) | | _ | · | • - | - |
| USSR | _ | - | - | - | - , |
| Total | 30,835 | 31,173 | 42,817 | 33,081 | 32,796 |
| 4 | | | | | |

Preliminary.

Significant quantities taken in Divisions VIIg-k not included every year.

Table 5.2 Catch in numbers (thousands) by length group in the Portuguese and Spanish blue whiting fisheries, 1983-1987.

| 10
12
34
56
78
90
12
34
56
78
90
12
34
56
78
90
12
34
56
78
90
12
34
56
78
90
12
34
56
78 | -
13
253 | -
3 | 8 | | |
|--|-------------------|-------------------|-------------------|-------------------|---------|
| 23456789012345678901234567890123456 | | 3 | | - | 1 |
| 3
4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9
6
7
8
9
6
7
6
7
6
7
8
9
7
8
7
8
7
8
7
8
7
8
7
8
7
8
7
8
7 | | | 25 | - | 33 |
| 4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9
6
7
8
9
6
7
6
6
7
6
7
6
7
6
7
6
7
6
7
6
7
6
7 | 253 | 41 | 39 | 118 | 37 |
| 5
6
7
8
9
0
1
2
3
4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9
6
7
8
9
6
7
6
6
7
6
7
6
7
6
7
6
7
6
7
6
7
6
7 | | 337 | 74 | 783 | 1,130 |
| 6
7
8
9
0
1
2
3
4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9
4
5
6
7
8
9
6
7
6
6
7
6
7
6
7
6
7
6
7
6
7
6
7
7
7
8
7
8 | 1,390 | 13,263 | 498 | 5,903 | 16,889 |
| 7
8
9
0
1
2
3
4
5
6
7
8
9
9
0
1
2
3
4
5
6
7
8
9
4
5
6
7
8
9
4
5
6
7
8
9
6
7
8
9
6
7
8
9
7
8
9
8
9
7
8
9
7
8
9
8
9
8
9
8
9 | 18,613 | 48,364 | 13,013 | 7,234 | 44,625 |
| 8
9
0
1
2
3
4
5
6
7
8
9
9
0
1
2
3
4
5
6
7
8
9
4
5
6
7
8
9
4
5
6
7
6
7
6
7
8
9
7
8
9
7
8
7
8
9
7
8
7
8
7
8
7
8
7 | 63,241 | 88,023 | 31,407 | 6,394 | 39,111 |
| 9
20
1
2
3
4
5
6
7
8
9
9
0
1
2
3
4
5
6
7
8
9
4
9
4
5
6
7
8
9
6
7
6
7
8
9
6
7
8
9
6
7
8
9
7
8
9
7
8
9
8
9
7
8
9
8
9
8
9
8
9 | 67,446 | 142,003 | 73,885 | 16,669 | 52,790 |
| 20
1
2
3
4
5
6
7
8
9
9
0
1
2
3
4
5
6
7
8
9
4
9
1
2
3
4
5
6
7
6
7
8
9
6
7
8
9
8
9
8
9
8
9
8
9
8
9
8
9
8
9
8
9
8 | 95,625 | 154,385 | 181,222 | 49,746 | 102,112 |
| 1
2
3
4
5
6
7
8
9
30
1
2
3
4
5
6
7
8
9
4
9
4
1
2
3
4
5
6 | 97,379 | 128,950 | 235,008 | 82,458 | 131,911 |
| 2
3
4
5
6
7
8
9
30
1
2
3
4
5
6
7
8
9
4
9
4
1
2
3
4
5
6 | 81,201 | 91,952 | 211,958 | 99,258 | 116,195 |
| 3
4
5
6
7
8
9
30
1
2
3
4
5
6
7
8
9
4
9
1
2
3
4
5
6
7
8
9
6
7
8
9
6
7
8
9
8
9
8
9
8
9
8
9
8
9
8
9
8
9
8
9
8 | 66,757 | 69,370 | 127,966 | 126,338 | 71,862 |
| 4
5
6
7
8
9
30
1
2
3
4
5
6
7
8
9
4
9
1
2
3
4
5
6
7
8
9
6
7
8
9
6
1
6
1
2
3
4
5
6 | 58,748 | 44,241 | 69,313 | 107,413 | 46,724 |
| 5
6
7
8
9
30
1
2
3
4
5
6
7
8
9
4
1
2
3
4
5
6
7
8
9
4
5
6 | 43,069 | 27,623 | 28,905 | 57,835 | 35,691 |
| 6
7
8
9
30
1
2
3
4
5
6
7
8
9
40
1
2
3
4
5
6 | 25,651 | 16,420 | 11,842 | 23,594 | 20,522 |
| 7
8
9
30
1
2
3
4
5
6
7
8
9
40
1
2
3
4
5
6 | 10,990 | 7,744 | 5,946 | 9,840 | 11,696 |
| 8
9
30
1
2
3
4
5
6
7
8
9
40
1
2
3
4
5
6 | 5,221 | 3,309 | 3,089 | 3,759 | 7,461 |
| 9
30
1
2
3
4
5
6
7
8
9
40
1
2
3
4
5
6 | 3,670 | 1,194 | 1,263 | 2,033 | 3,717 |
| 30
1
2
3
4
5
6
7
8
9
40
1
2
3
4
5
6 | 2,855 | 854 | 899 | 1,091 | 1,965 |
| 1
2
3
4
5
6
7
8
9
40
1
2
3
4
5
6 | 1,465 | 800 | 622 | 47/3 | 994 |
| 2
3
4
5
6
7
8
9
40
1
2
3
4
5
6 | 1,381 | 199 | 296 | 308 | 918 |
| 3
4
5
6
7
8
9
40
1
2
3
4
5
6 | 342 | 216 | 205 | 165 | 177 |
| 4
5
6
7
8
9
40
1
2
3
4
5
6 | 58 | 103· | 172 | 174 | 119 |
| 5
6
7
8
9
40
1
2
3
4
5
6 | 8 | 117 | 64 | 255 | 46 |
| 6
7
8
9
40
1
2
3
4
5 | 1 | 16 | 54 | 269 | 30 |
| 7
8
9
40
1
2
3
4
5 | 4 | 22 | 23 | 167 | 12 |
| 8
9
40
1
2
3
4
5 | - | 32 | 15 | 67 | 6 |
| 9
40
1
2
3
4
5 | 4 | 20 | 6 | 8O° | 1 |
| 40
1
2
3
4
5 | | 2 | 2 | 56 | 5 |
| 1
2
3
4
5
6 | 8 | 2 | 2 | 1 | - |
| 2
3
4
5
6 | - | 4 | 3 | 8 | - |
| 3
4
5
6 | - | | 3 | - | - |
| 4
5
6 | - | _ | 1 | | - |
| 5
6 | - | 2 | 1 | - | - |
| 6 | - | - | | - | - |
| | - | - | - | _ | *** |
| 1 | - | - | - | | |
| | - | - | - | _ | - |
| 8 | - | - | 1 | - | |
| 9
50 | - | - | _ | - | _ |
| 50 | | → | | | - |
| otal N
andings (t) | 645,393
30,785 | 839,611
31,173 | 997,830
42,817 | 602,489
33,083 | 707,780 |

Table 5.1 Landings (tonnes) of BLUE WHITING from the southern areas (Sub-areas VIII and IX and Divisions VIIg-k and VIId, e and since 1984, the Divisions VIIg-k are not included), 1978-1987, as estimated by the Working Group.

| Country | 1978 | 1979 | 1980 | 1981 | 1982 |
|--------------------|-------------|--------|--------|-------------|--------|
| Germany, Fed.Rep | 25 | _ | - | | - |
| Ireland | | 1 | - | _ | _ |
| Netherlands | 7 | - | 31 | 633 | 200 |
| Poland | 53 | _ | | - | 200 |
| Portugal | 2,381 | 2,096 | 6,051 | 7,387 | 3,890 |
| Spain ² | 31,428 | 25,016 | 23,862 | 30,728 | 27,500 |
| UK (Scotland) | - | 63 | · _ | | , |
| USSR | 4 | | - | - | - |
| Total | 33,898 | 27,176 | 29,944 | 38,748 | 31,590 |

| 1983 | 1984 | 1985 | 1986 | 1987 ¹ |
|-----------------|--------------------------------------|--|-----------------|-------------------|
| 50 | | | | - |
| - | - | → | _ | |
| _ | - | _ | _ | |
| - | _ | _ | _ | 4 |
| - | _ | | ••• | - |
| 4,748
26,037 | 5,252
25,921 | 6,989
35,828 | 8,116
24,965 | 9,148
23,644 |
| | - | - | | - |
| 30,835 | 31,173 | 42,817 | 33,081 | 32,796 |
| | 50
-
-
-
4,748
26,037 | 50 -

4,748 5,252
26,037 25,921 | 50 | 50 |

Preliminary.

Significant quantities taken in Divisions VIIg-k not included in the table are discarded every year.

Table 5.2 Catch in numbers (thousands) by length group in the Portuguese and Spanish blue whiting fisheries, 1983-1987.

| 10
1
2
3 | -
-
13 | -
3 | 8. | | |
|-----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 2
3 | -
13 | 3 | | | 1 |
| 3 | 13 | | 25 | _ | 33 |
| | | 41 | 39 | 118 | 37 |
| | 253 | 337 | 74 | 783 | 1,130 |
| 4 | 1,390 | 13,263 | 498 | 5,903 | 16,889 |
| 5 | 18,613 | 48,364 | 13,013 | 7,234 | 44,625 |
| 6 | 63,241 | 88,023 | 31,407 | 6,394 | 39,111 |
| 7
8 | 67,446 | 142,003 | 73,885 | 16,669 | 52,790 |
| 9 | 95,625 | 154,385 | 181,222 | 49,746 | 102,112 |
| 20 | 97,379 | 128,950 | 235,008 | 82,458 | 131,911 |
| 1 | 81,201
66,757 | 91,952 | 211,958 | 99,258 | 116,195 |
| 2. | 58,748 | 69,370
44,241 | 127,966 | 126,338 | 71,862 |
| 3 | 43,069 | 27,623 | 69,313 | 107,413 | 46,724 |
| 4 : | 25,651 | 16,420 | 28,905
11,842 | 57,835
23,594 | 35,691
20,522 |
| 5 | 10,990 | 7,744 | 5,946 | 9,840 | 11,696 |
| 6 | 5,221 | 3,309 | 3,089 | 3,759 | 7,461 |
| ž | 3,670 | 1,194 | 1,263 | 2,033 | 3,717 |
| 8 | 2,855 | 854 | 899 | 1,091 | 1,965 |
| 9. | 1,465 | 800 | 622 | 473 | 994 |
| 30 | 1,381 | 199 | 296 | 308 | 918 |
| 1 | 342 | 216 | 205 | 165 | 177 |
| 2 | 58 | 103 | 172 | 174 | 119 |
| 3 | 8 | 117 | 64 | 255 | 46 |
| 4' | 1 | 16 | 54 | 269 | 30 |
| 5 | 4 | 22 | 23 | 167 | 12 |
| 6 | - | 32 | 15 | 67 | 6 |
| 7 | 4 | 20° | 6 | 8Q ⁻ | 1 |
| 8 | - | 2 | 2 | 5.6 | 5 |
| 9. | 8 | 2 | 2 | 1 | - |
| 40 | | 4 | 3 | 8 | - |
| 1 . | | - | 3 | - | - |
| 2 | - | _ | 1 | - | |
| 3 [.]
4. | - | 2 . | 1 | - | - |
| 5 | - | - | | - | - |
| 6 | - | - | - | - | - |
| 7 | _ | | - | - | _ |
| 8 | | - | -
1 | - | - |
| 9 | ~ | _ | <u> </u> | | |
| 5 0 | _ | -
- | - | - | - |
| otal N
andings (t) | 645,393
30,785 | 839,611
31,173 | 997,830
42,817 | 602,489
33,083 | 707,780
32,792 |

Table 5.3 Catch in numbers (millions) by age group in the Portuguese and Spanish blue whiting fisheries, 1981-1987.

| Age | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|-------------|--------|--------|--------|--------|--------|--------------|----------------|
| 0 | 48.0 | 61.1 | 98.0 | 73.9 | 118.3 | | |
| 1 | 189.1 | 102.5 | 149.7 | 223.2 | 285.9 | 32.4
93.2 | 105.3
382.6 |
| 2 | 226.2 | 183.5 | 238.5 | 349.0 | 337.2 | 218.2 | 110.6 |
| 3 | 166.4 | 121.8 | 68.2 | 127.4 | 170.5 | 167.6 | 61.6 |
| 4 | 50.0 | 64.3 | 45,1 | 35.0 | 65.9 | 68.1 | 28.2 |
| 5 | 25.9 | 22.1 | 34.0 | 13.2 | 13.6 | 15.1 | 13.4 |
| 6 | 3.0 | 3.2 | 8.8 | 13.8 | 3.0 | 5.7 | 3.4 |
| 7 | 0.2 | 0.3 | 2.3 | 3.3 | 2.4 | 1.0 | 1.0 |
| 8+ | 0.2 | 1.0 | 0.8 | 0.8 | 1.1 | 1.0 | 1.0 |
| Total | 709 | 559.9 | 645.4 | 839.6 | 997.8 | 602.5 | 707.1 |
| Nominal (t) | 38,115 | 31,390 | 30,785 | 31,173 | 42,817 | 33,083 | 32,792 |
| SOP | 37,624 | 33,660 | 31,805 | 31,370 | 42,839 | 33,981 | 32,792 |
| พี (g) | 53.1 | 60.0 | 49.3 | 37.4 | 44.0 | 56.4 | 46.4 |

 $\frac{\text{Table 5.4}}{\text{Mean length and mean weights of BLUE WHITING landed by Portugal and Spain in the period 1981-1987.}$

| λαo | 1981
Age ——— | 1981 | | 1982 | | 1983 | | 1984 | | 1985 | | 1986 | 19 | 987 |
|-----|-----------------|-------|------|------|------|-------|------|-------|------|-------|------|-------|------|-------|
| nyc | Ē | w | Ē | w | Ē | W | Ī. | W | Ē | W | Ē | w | - L | w |
| 0 | 18.0 | 37.6 | 17.3 | 32 | 16.5 | 28.6 | 15.7 | 21.6 | 17.2 | 28.6 | 16.8 | 26.3 | 17.3 | 28.9 |
| 1 | 19.7 | 48.1 | 19.5 | 45 | 18.3 | 39.0 | 17.3 | 28.7 | 18.7 | 36.9 | 19.4 | 41.7 | 19.0 | 39.0 |
| 2 | 20.1 | 50.6 | 21.7 | 61 | 19.5 | 46.5 | 18.4 | 34.6 | 19 6 | 43.4 | 20.8 | 52.1 | 21.6 | 58.8 |
| 3 | 21.0 | 57.6 | 22.5 | 69 | 21.9 | 65.8 | 20.8 | 50.5 | 20.5 | 49.9 | 22.1 | 63.2 | 23.0 | 71.8 |
| 4 | 22.2 | 67.7 | 23.4 | 77 | 23.0 | 75.6 | 22.8 | 65.9 | 21.9 | 61.2 | 23.1 | 72.8 | 24.2 | 84.5 |
| 5 | 22.6 | 69.9 | 24.2 | 85 | 23.8 | 84.4 | 24.0 | 77.0 | 23.2 | 73.4 | 24.7 | 90.2 | 25.1 | 94.9 |
| 6 | 24.1 | 83.7 | 25.8 | 103 | 25.6 | 104.5 | 24.4 | 81.1 | 25.8 | 103.9 | 25.3 | 97.4 | | 117.0 |
| 7 | 30.0 | 154.5 | 29.8 | 156 | 27.1 | 123.5 | 25.7 | 94.1 | 26.4 | 111.6 | 29.3 | 155.6 | | 137.7 |
| 8+ | 32.9 | 200.4 | 35.8 | 269 | 28.7 | 145.4 | 28.7 | 131.4 | 28.3 | 139.1 | 34.3 | 257.4 | | 160.8 |

Table 5.3 Catch in numbers (millions) by age group in the Portuguese and Spanish blue whiting fisheries, 1981-1987.

| Age | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|-------------|--------|--------|--------|--------|--------|--------|--------|
| 0 | 48.0 | 61.1 | 98.0 | 73.9 | 118.3 | 32.4 | 105.3 |
| 1 | 189.1 | 102.5 | 149.7 | 223.2 | 285.9 | 93.2 | 382.6 |
| 2 | 226.2 | 183.5 | 238.5 | 349.0 | 337.2 | 218.2 | 110.6 |
| 3 | 166.4 | 121.8 | 68.2 | 127.4 | 170.5 | 167.6 | 61.6 |
| 4 | 50.0 | 64.3 | 45.1 | 35.0 | 65.9 | 68.1 | 28.2 |
| 5 | 25.9 | 22.1 | 34.0 | 13.2 | 13.6 | 15.1 | 13.4 |
| 6 | 3.0 | 3.2 | 8.8 | 13.8 | 3.0 | 5.7 | 3.4 |
| 7 | 0.2 | 0.3 | 2.3 | 3.3 | 2.4 | 1.0 | 1.0 |
| 8+ | 0.2 | 1.0 | 0.8 | 0.8 | 1.1 | 1.0 | 1.0 |
| Total | 709 | 559.9 | 645.4 | 839.6 | 997.8 | 602.5 | 707.1 |
| Nominal (t) | 38,115 | 31,390 | 30,785 | 31,173 | 42,817 | 33,083 | 32,792 |
| SOP | 37,624 | 33,660 | 31,805 | 31,370 | 42,839 | 33,981 | 32,792 |
| w (g) | 53.1 | 60.0 | 49.3 | 37.4 | 44.0 | 56.4 | 46.4 |

Table 5.4 Mean length and mean weights of BLUE WHITING landed by Portugal and Spain in the period 1981-1987.

| Age | 1: | 981 | | 1982 | | 1983 | | 1984 | | 1985 | | 1986 | 1 | 987 |
|-----|------|-------|------|------|------|-------|------|-------|------|--------------|------|-------|------|-------|
| Ayc | Ī | w | Ē | w | Ē | พื | Ī | W | Ē | v | Ē | w | Ī | w |
| 0 | 18.0 | 37.6 | 17.3 | 32 | 16.5 | 28.6 | 15.7 | 21.6 | 17.2 | 28.6 | 16.8 | 26.3 | 17.3 | 28.9 |
| 1 | 19.7 | 48.1 | 19.5 | 45 | 18.3 | 39.0 | 17.3 | 28.7 | 18.7 | 36.9 | 19.4 | 41.7 | 19.0 | 39.0 |
| 2 | 20.1 | 50.6 | 21.7 | 61 | 19.5 | 46.5 | 18.4 | 34.6 | 19.6 | 43.4 | 20.8 | 52.1 | 21.6 | 58.8 |
| 3 | 21.0 | 57.6 | 22.5 | 69 | 21.9 | 65.8 | 20.8 | 50.5 | 20.5 | 49.9 | 22.1 | 63.2 | 23.0 | 71.8 |
| 4 | 22.2 | 67.7 | 23.4 | 77 | 23.0 | 75.6 | 22.8 | 65.9 | 21.9 | 61.2 | 23.1 | 72.8 | 24.2 | 84.5 |
| 5 | 22.6 | 69.9 | 24.2 | 85 | 23.8 | 84.4 | 24.0 | 77.0 | 23.2 | 73.4 | 24.7 | 90.2 | 25.1 | 94.9 |
| 6 | 24.1 | 83.7 | 25.8 | 103 | 25.6 | 104.5 | 24.4 | 81.1 | 25.8 | 103.9 | 25.3 | 97.4 | • • | 117.0 |
| 7 | 30.0 | 154.5 | 29.8 | 156 | 27.1 | 123.5 | 25.7 | 94.1 | 26.4 | 111.6 | 29.3 | 155.6 | | 137.7 |
| 8+ | 32.9 | 200.4 | 35.8 | 269 | 28.7 | 145.4 | 28.7 | 131.4 | 28.3 | 139.1 | 34.3 | 257.4 | | 160.8 |

Table 5.5 Catch per unit effort by Spanish vessels landing in the main Galician ports, 1977-1987.

| Year | Landings
(tonnes) | Effort
(days fishing) | CPUE
(kg/day) |
|------|----------------------|--------------------------|------------------|
| 1977 | 18,449 | 15,515 | 1,189 |
| 1978 | 22,286 | 16,059 | 1,388 |
| 1979 | 19,507 | 20,748 | 953 |
| 1980 | 18,478 | 17,229 | 1,072 |
| 1981 | 23,577 | 19,112 | 1,234 |
| 1982 | 20,940 | 19,320 | 1,084 |
| 1983 | 23,042 | 19,948 | 1,155 |
| 1984 | 22,305 | 19,015 | 1,173 |
| 1985 | 30,585 | 19,209 | 1,592 |
| 1986 | 19,929 | 17,985 | 1,108 |
| 1987 | 19,000 | 18,358 | 1,035 |

Table 5.6 Catch per unit effort by Spanish single and pair trawlers landing in the main Galician ports, 1983-1987.

| Year | Landings
(tonnes) | Effort
(days fishing) | CPUE
(kg/day) |
|------|----------------------|--------------------------|------------------|
| | | Single trawlers | |
| 1983 | 16,813 | 18,071 | 930 |
| 1984 | 10,580 | 15,004 | 705 |
| 1985 | 15,752 | 14,616 | 1,078 |
| 1986 | 7,182 | 12,643 | 568 |
| 1987 | 4,843 | 13,190 | 367 |
| | | Pair trawlers | |
| 1983 | 6,228 | 1,877 | 3,318 |
| 1984 | 11,726 | 4,011 | 2,924 |
| 1985 | 14,833 | 4,593 | 3,230 |
| 1986 | 12,747 | 5,341 | 2,387 |
| 1987 | 14,154 | 5,168 | 2,739 |

Table 5.7

```
SOUTHERN BLUE WHITING TUNING DATA 101 cpue Spanish Trawl 81,87 1,1 0,7 1,1714,6109, 7081,5110,1550, 809, 86,6 1,1512,3201, 6608,4962,3979,1998,249,9 1,2780,5025, 8283,2635,1777,1328,315,68 1,2416,7290,12205,5115,1472, 556,582,138 1,4039,9274,13795,7760,3513, 748,154,131 1, 706,1934, 5687,5530,2812, 607,246,40 1,1911,9794, 4317,2563,1307, 529,122,40
```

Table 5.5 Catch per unit effort by Spanish vessels landing in the main Galician ports, 1977-1987.

| Year | Landings
(tonnes) | · Effort
(days fishing) | CPUE
(kg/day) |
|------|----------------------|----------------------------|------------------|
| 1977 | 18,449 | 15,515 | 1,189 |
| 1978 | 22,286 | 16,059 | 1,388 |
| 1979 | 19,507 | 20,748 | 953 |
| 1980 | 18,478 | 17,229 | 1,072 |
| 1981 | 23,577 | 19,112 | 1,234 |
| 1982 | 20,940 | 19,320 | 1,084 |
| 1983 | 23,042 | 19,948 | 1,155 |
| 1984 | 22,305 | 19,015 | 1,173 |
| 1985 | 30,585 | 19,209 | 1,592 |
| 1986 | 19,929 | 17,985 | 1,108 |
| 1987 | 19,000 | 18,358 | 1,035 |

Table 5.6 Catch per unit effort by Spanish single and pair trawlers landing in the main Galician ports, 1983-1987.

| Year | Landings
(tonnes) | Effort
(days fishing) | CPUE
(kg/day) |
|------|----------------------|--------------------------|------------------|
| | | Single trawlers | |
| 1983 | 16,813 | 18,071 | 930 |
| 1984 | 10,580 | 15,004 | 705 |
| 1985 | 15,752 | 14,616 | 1,078 |
| 1986 | 7,182 | 12,643 | 568 |
| 1987 | 4,843 | 13,190 | 367 |
| | | Pair trawlers | |
| 1983 | 6,228 | 1,877 | 3,318 |
| 1984 | 11,726 | 4,011 | 2,924 |
| 1985 | 14,833 | 4,593 | 3,230 |
| 1986 | 12,747 | 5,341 | 2,387 |
| 1987 | 14,154 | 5,168 | 2,739 |

Table 5.7

```
SOUTHERN BLUE WHITING TUNING DATA 101 cpue Spanish Trawl 81,87 1,1 0,7 1,1714,6109, 7081,5110,1550, 809, 86,6 1,1512,3201, 6608,4962,3979,1998,249,9 1,2780,5025, 8283,2635,1777,1328,315,68 1,2416,7290,12205,5115,1472, 556,582,138 1,4039,9274,13795,7760,3513, 748,154,131 1, 706,1934, 5687,5530,2812, 607,246,40 1,1911,9794, 4317,2563,1307, 529,122,40
```

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Title: BLUE WHITING, SOUTHERN AREA At 11.37.40 25 SEPTEMBER 1988 from 81 to 87 on ages 0 to 7 with Terminal F of .720 on age 2 and Terminal S of 1.000

Initial sum of squared residuals was 44.617 and final sum of squared residuals is 8.901 after 49 iterations

Matrix of Residuals

| WTS | 1.000
1.000
1.000
953
972
688
524 | | | | | | |
|---------------|---|------|-------|-----------------|-------------|------------------|-------------|
| | 0000.000.000.000 | .000 | | | | | 1.0000 |
| | | | | | 87 | | 6
1.3368 |
| 86/87 | -1.691
098
-125
1447
171 | .000 | 1,000 | | 86
.9025 | | 5 |
| 98/58 | 1.259
547
232
213
199
581 | .000 | 1.000 | | 85 | | 4
1.3242 |
| 84/85 | 215
010
021
261
105
262 | 000. | 1.000 | | 84
.7415 | | 3 |
| 83/84 | .358
.044
.079
.353
.124
.125 | 000. | 1.000 | | 83
.6209 | | 2
1.0000 |
| 82/83 | 264
310
307
155
033 | .000 | 1.000 | es (F) | 82
.5490 | (8) | 3672 |
| 81/82 | | .000 | 1,000 | Mortalities (F) | 81 | -at-age | 0
.0931 |
| Years
Ages | 010 m 4 m 9 m 9 m 9 m 9 m 9 m 9 m 9 m 9 m 9 | | WTS | Fishing M | F-values | Selection-at-age | S-values |

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VIRTUAL POPULATION ANALYSIS Table 5.9

BLUE WHITING, SOUTHERN AREA

| FISHING MORTALITY COEFFICIENT | UNIT: Year-1 | NATURAL | NATURAL MORTALITY COEFFICIE | COEFFICI |
|---|--------------|---------|-----------------------------|----------|
| * ? * * * * * * * * * * * * * * * * * * | | | | |

| nT = | | | |
|-----------------------|---------|--|----------------|
| TY COEFFICIENT | 1981-87 | 0 | |
| MORTALITY | 1987 1 | | .26 |
| NATURAL | 1986 | 1444
0.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2 | 1.29 |
| Year-1 | 1985 | 1.26
1.26
1.26
1.26
1.26
1.26
1.26 | 1.56 |
| UNIT: Ye | 1984 | 60000000000000000000000000000000000000 | 8.
8. 10. |
| 1 1 | 1983 | 08
1.06
60
1.06
1.06
1.06
1.06 | .23 |
| COEFFICI | 1982 | .05
.115
.71
.77
.77
.40 | .24 |
| MOKIMETIY COEFFICIEN! | 1981 | 11.24
1.29
1.29
1.71 | 85
85 |
| DIA BATTUOT | | O H W W 4 ™ Ø V → | 0-3)W
4-7)W |

Table 5.8

Title: BLUE WHITING, SOUTHERN AREA At 11.37.40 26 SEPTEMBER 1988 from 81 to 87 on ages 0 to 7 with Terminal F of .720 on age 2 and Terminal S of 1.000

44.617 and 8.901 after 49 iterations Initial sum of squared residuals was final sum of squared residuals is

Matrix of Residuals

| | WTS | .874 | | .524 | | | | | | | |
|---------------------|---------------|---------------------|----------------------------|-------|------|-------|-------------------------|-------------|------------------|-------------|--|
| | | 000. | 2000 | 000 | .000 | | | | | 1.0000 | |
| | | | | | | | | 87 | | 6
1.3358 | |
| | 86/87 | -1.691
098 | 149 | .015 | .000 | 1.000 | | 86
.9025 | | 5 | |
| | 85/86 | 1.259 | .199 | -,398 | 000. | 1.000 | | 85 | | 4 | |
| | 84/85 | 215
.010
021 | 261 | .471 | .000 | 1.000 | | 84 | | 3
1.1830 | |
| | 83/84 | .323 | 079 | 125 | .000 | 1.000 | | 83
.6209 | | 2 | |
| ω [| 82/83 | .264
310
.452 | .307
155
033 | 723 | .000 | 1.000 | es (F) | 82
.5490 | (8) | 1.3672 | |
| residuai | 81/82 | .173 | 453
453 | .760 | 000. | 1.000 | Fishing Mortalities (F) | 81 | | 0
.0931 | |
| Hatiix of Kesiduals | Years
Ages | 777 | 5/4
5/7
5/00
5/00 | 2 /9 | | WTS | Fishing A | F.values | Selection-at-age | S-values | |

.20

Table 5.9 VIRTUAL POPULATION ANALYSIS

BLUE WHITING, SOUTHERN AREA

| MORTALITY COEFFICIENT = | 1987 1981-87 | .07 .08
.43 .31
.54 .71
.72 .85
.80 .94
1.05 1.03
1.06 1.01
.93 .75 | .26
.88 |
|-------------------------|--------------|--|----------------------|
| NATURAL N | 1986 | | .33 |
| Year-1 | 1985 | 1,26
1,26
1,26
1,26
1,26
1,26
1,26
1,26 | 1.15 |
| UNIT: YE | 1984 | 200
200
200
200
200
200
200
200
200
200 | స్త్రి |
| ENT | 1983 | 0111
0001
00022
00024 | .23 |
| MORTALITY COEFFICIENT | 1982 | .05
.15
.71
.90
.47
.40 | .24 |
| | 1981 | |
8.0
8.0 |
| FISHING MO | | 0
− − − − − − − − − − − − − − − − − − − | (0- 3)W
(4- 7)W |

Table 5.10 VIRTUAL POPULATION ANALYSIS

BLUE WHITING, SOUTHERN AREA

STOCK SIZE IN NUMBERS UNIT: millions

BIOMASS TOTALS UNIT: thousand tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .250

| | 1988 | 1370
647
111
522
21
2 | |
|---------------|------|--|--|
| | 1987 | 1790
1209
256
131
56
22
6 | 3473
446
132
26 |
| .250 | 1986 | 1513
415
397
249
101
23
2 | 2711
460
105
28 |
| : ONC: | 1985 | 637
672
672
309
100
25
6 | 2553
681
102
33 |
| SPAWNING: | 1984 | 1056
1066
1066
261
261
21
21
21 | 3258
736
101
31 |
| M BEFORE | 1983 | 1409
1090
1579
158
175
173
2 | 3397
643
134
35 |
| ANNUAL | 1982 | 1399
820
820
824
447
85
85
85
85
85
85
85
85
85
85
85
85
85 | 3041
604
138
40 |
| PROPORTION OF | 1981 | 1054
688
520
361
109
39
4
4 | 2777
689
131
39 |
| PROF | | 040w4rv7v+ | TOTAL NO
SPS NO
TOT.BIOM
SPS BIOM |

Table 6.1 Total catches of BLUE WHITING in 1978-1987 divided into areas within and beyond areas of national fisheries inrisdiction of NEAFC contracting narties. Percentage in ().

| Year | Inter-
national | Svalbard | Jan Mayen | Norway | Iceland | Greenland | Faroes | EEC | Total (t) | Total
from off.
data (t) | 0/5 |
|------|---------------------|----------|-----------------|--------------------|-----------------|-----------------|--------------------|--------------------|-----------|--------------------------------|-------|
| 1978 | 136,504
(25.52) | 1 | 1 | 67,391 | 26,444 (4.94) | 6,580 | 195,361 (36.53) | 102,523 | 534,803 | 574,812 | 93.0 |
| 1979 | 614,734
(56.18) | ı | i | 75,545
(6.90) | 15,117 (1.38) | 204
(0.02) | 224,201
(20.49) | 164,388
(15.02) | 1,094,189 | 1,091,422 | 100.3 |
| 1980 | 567, 693
(55.23) | ı | İ | 152,095
(14.80) | 4,562
(0.44) | 8,757
(0.85) | 164,342
(15.99) | 130,417 (12.69) | 1,027,866 | 1,092,620 | 94.1 |
| 1981 | 168,681
(19.76) | į | 123,000 (14.41) | 215,004
(25.18) | 7,751 (0.91) | ł | 174,801 (20.48) | 164,475
(19.27) | 853,712 | 870,808 | 98.0 |
| 1982 | 22,993
(4.32) | i | ſ | 130,435
(24.51) | 5,797 | ı | 125,072
(23.50) | 247,884
(46.58) | 532,181 | 544,919 | 97.7 |
| 1983 | 15,203
(2.93) | 1 | ž | 109,675 (21.15) | 7,000 | 1 | 91,804 | 294,981
(56.87) | 518,663 | 539,235 | 96.2 |
| 1984 | 18,407 | ı | 1 | 150,603
(26.13) | 105
(0.02) | ı | 124,905 (21.67) | 282,418
(48.99) | 576,438 | 586,504 | 98.3 |
| 1985 | 38,978
(6.07) | ŧ | ı | 114,785 | | I | 196,003
(30.52) | 292,345
(45.53) | 642,111 | 644,899 | 9.66 |
| 1986 | 20,665
(2.74) | 1 | ı | 187,768
(24.87) | ţ | 116
(0.02) | 171,074 (22.66) | 375,257
(49.71) | 754,880 | 757,370 | 99.7 |
| 1987 | 103,535 (17.76) | I | İ | 109,201 | 1 | 1 | 135,980 | 234,249 | 582,830 | 631,610 | 92.3 |

Table 5.10 VIRTUAL POPULATION ANALYSIS

BLUE WHITING, SOUTHERN AREA

STOCK SIZE IN NUMBERS UNIT: millions

BIOMASS TOTALS UNIT: thousand tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .250
PROPORTION OF ANNUAL M BEFORE SPAWNING: .250

| 1988 | 1370
647
111
52
21
2 | |
|------|---|--|
| 1987 | 1790
1209
256
131
56
22
6 | 3473
446
132
26 |
| 1986 | 1513
415
415
397
249
101
23
8 | 2711
460
105
28 |
| 1985 | 637
672
672
309
100
25
6 | 2553
681
102
33 |
| 1984 | 1056
1066
758
261
261
21
21
21 | 3258
736
101
31 |
| 1983 | 1409
10090
1579
158
75
173 | 3397
643
134
35 |
| 1982 | 1399
820
393
224
147
45
9 | 3041
604
138
40 |
| 1981 | 1054
688
520
361
109
39
4 | 2777
689
131
39 |
| | 012W470V+ | TOTAL NO
SPS NO
TOT.BIOM
SPS BIOM |

Table 6.1 Total catches of BLUE WHITING in 1978-1987

| Year | Inter-
national | Svalbard | Jan Mayen | Norway | Iceland | Greenland | Faroes | 의
원 | Total (t) | Total from off. | •// |
|------|----------------------|----------|-----------------|--------------------|---------------|---------------|---------------------|---------------------|-----------|-----------------|-------|
| 1978 | 136,504
(25,52) | | 1 | 67,391 | 26,444 (4.94) | 6,580 | 195,361 (36.53) | 102,523 (19.17) | | 574,812 | 93.0 |
| 1979 | 614,734
(56.18) | i | ì | 75,545 | 15,117 (1.38) | 204
(0.02) | 224, 201
(20.49) | 164,388
(15.02) | 1,094,189 | 1,091,422 | 100.3 |
| 1980 | 567, 693
(55.23) | ı | I | 152,095
(14.80) | 4,562 (0.44) | 8,757 (0.85) | 164,342
(15.99) | 130,417 (12.69) | 1,027,866 | 1,092,620 | 94.1 |
| 1981 | 168, 681
(19, 76) | 1 | 123,000 (14.41) | 215,004
(25.18) | 7,751 (0.91) | ł | 174,801 (20.48) | 164,475
(19.27) | 853,712 | 870,808 | 98.0 |
| 1982 | 22,993
(4.32) | 1 | i | 130,435 (24.51) | 5,797 | l | 125,072 (23.50) | 247,884
(46.58) | 532,181 | 544,919 | 97.7 |
| 1983 | 15, 203
(2, 93) | 1 | ł | 109,675 (21.15) | 7,000 | ſ | 91,804 (17.70) | 294,981
(56.87) | 518,663 | 539,235 | 96.2 |
| 1984 | 18,407 | 1 | ı | 150,603
(26.13) | 105
(0.02) | i | 124,905 | 282,418
(48.99) | 576,438 | 586,504 | 98.3 |
| 1985 | 38,978
(6.07) | ŧ | I | 114,785 | ì | i | 196,003
(30.52) | 292, 345
(45.53) | 642, 111 | 644,899 | 99.6 |
| 1986 | 20,665 | 1 | ı | 187,768
(24.87) | I | 116 (0.02) | 171,074
(22.66) | 375,257
(49.71) | 754,880 | 757,370 | 99.7 |
| 1987 | 103,535 (17.76) | 1 | ı | 109,201 | 1 | ı | 135,980 | 234,249 | 582,830 | 631,610 | 92.3 |

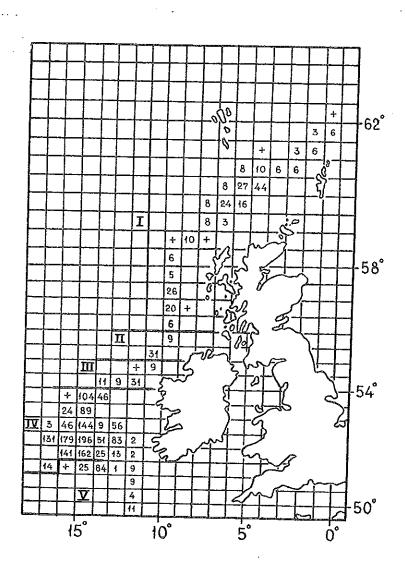


Figure 4.1 Distribution of blue whiting biomass ('000 t) observed during the first USSR survey in spring of 1988 (4-27 March).

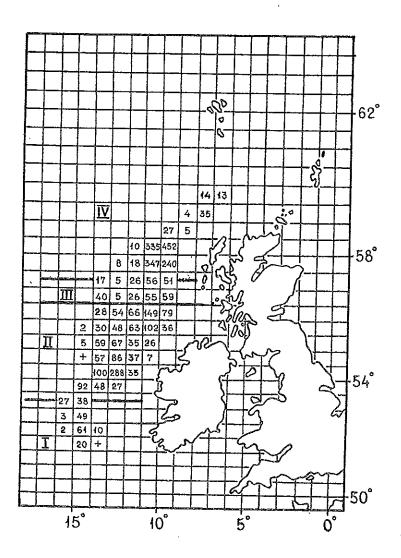


Figure 4.2 Distribution of blue whiting biomass ('000 t) observed during the second USSR survey in spring of 1988 (28 March - 21 April).

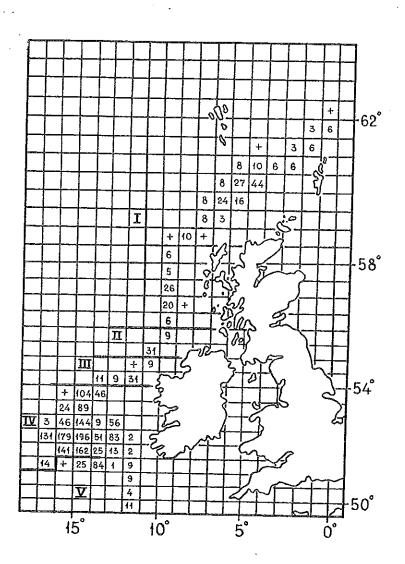


Figure 4.1 Distribution of blue whiting biomass ('000 t) observed during the first USSR survey in spring of 1988 (4-27 March).

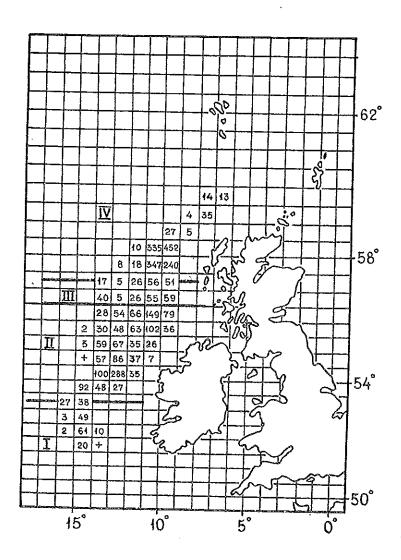


Figure 4.2 Distribution of blue whiting biomass ('000 t) observed during the second USSR survey in spring of 1988 (28 March - 21 April).

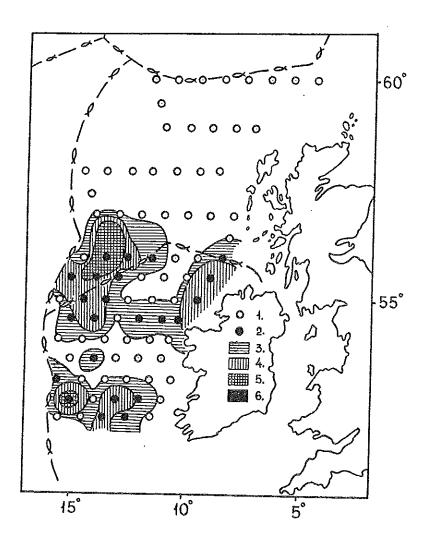


Figure 4.3 Distribution of larval blue whiting (ind./ m^2) during the second USSR survey (28 March - 21 April)

1 = negative fishing set
2 = positive fishing set
3 = 1-10 fish/m²
4 = 11-100 fish/m²
5 = 101-1000 fish/m²
6 = over 1000 fish/m²

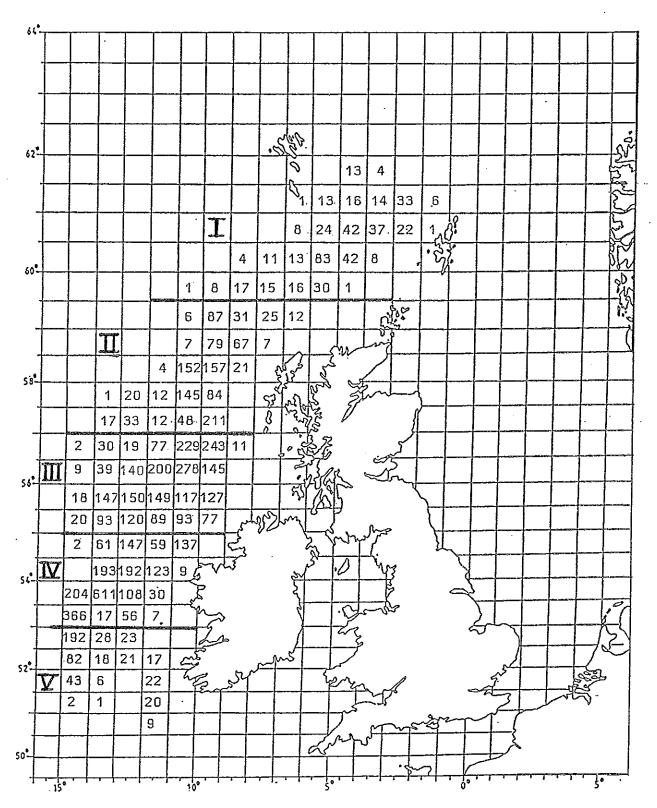


Figure 4.4 Distribution of blue whiting biomass ('000 t) observed during the Norwegian survey in spring of 1988 (25 March - 24 April).

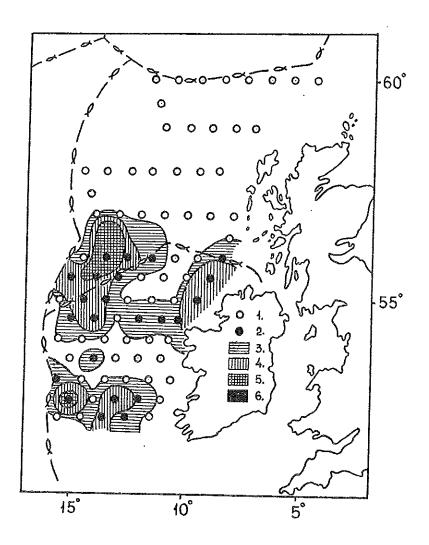


Figure 4.3 Distribution of larval blue whiting (ind./m²) during the second USSR survey (28 March - 21 April)

1 = negative fishing set
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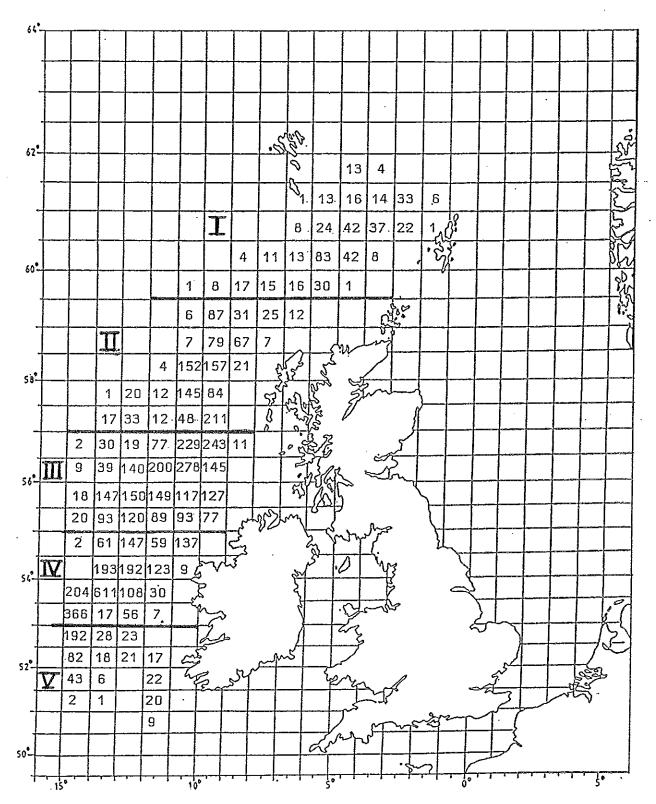
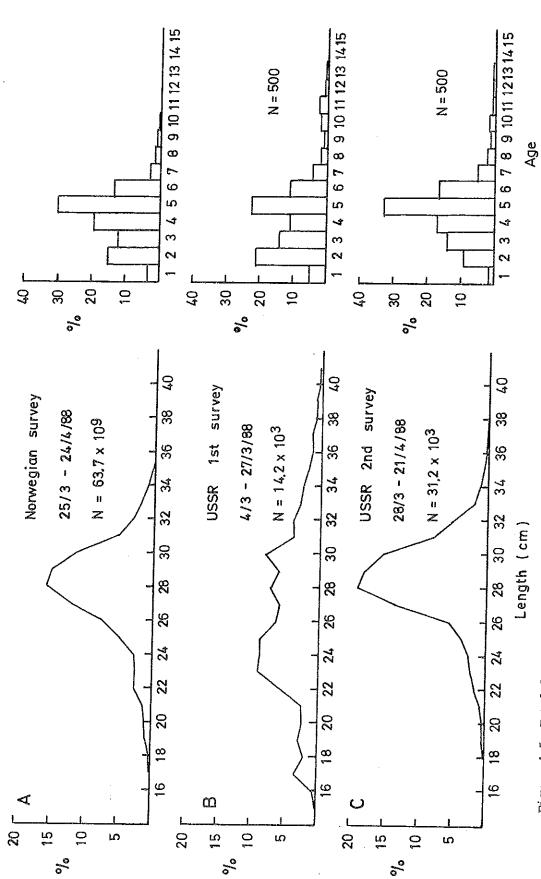
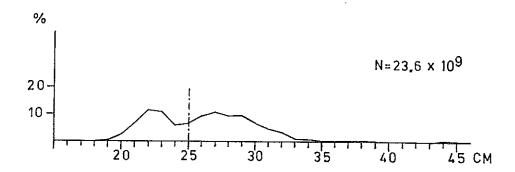


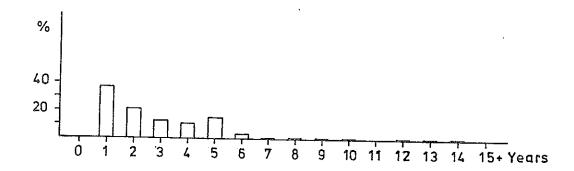
Figure 4.4 Distribution of blue whiting biomass ('000 t) observed during the Norwegian survey in spring of 1988 (25 March - 24 April).



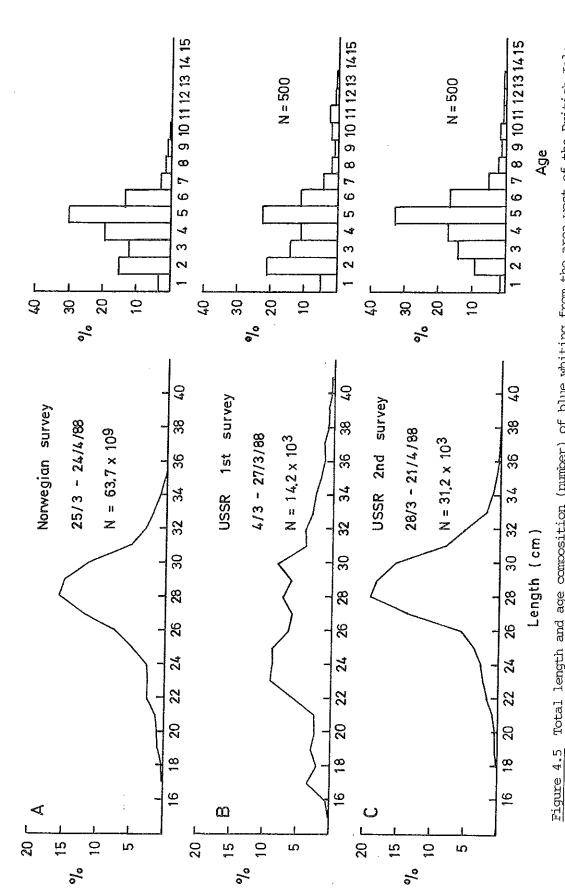
Total length and age composition (number) of blue whiting from the area west of the British Isles during spring of 1988. Figure 4.5

A: weighted by abundance N (Norway)
B-C: number of measured and aged specimens (USSR)



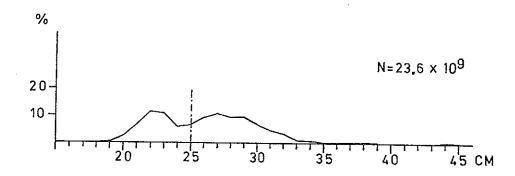


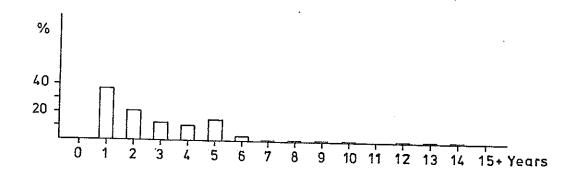
Figue 4.6 Total length and age compositions (number weighted by abundance) of blue whiting from the Norwegian survey in the Norwegian Sea, summer 1988 (18 July - 21 August).



Total length and age composition (number) of blue whiting from the area west of the British Isles during spring of 1988. A: weighted by abundance N (Norway)

B-C: number of measured and aged specimens (USSR)





Figue 4.6 Total length and age compositions (number weighted by abundance) of blue whiting from the Norwegian survey in the Norwegian Sea, summer 1988 (18 July - 21 August).

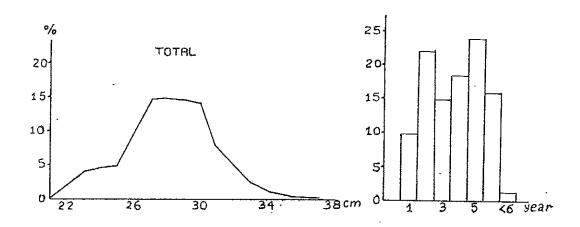
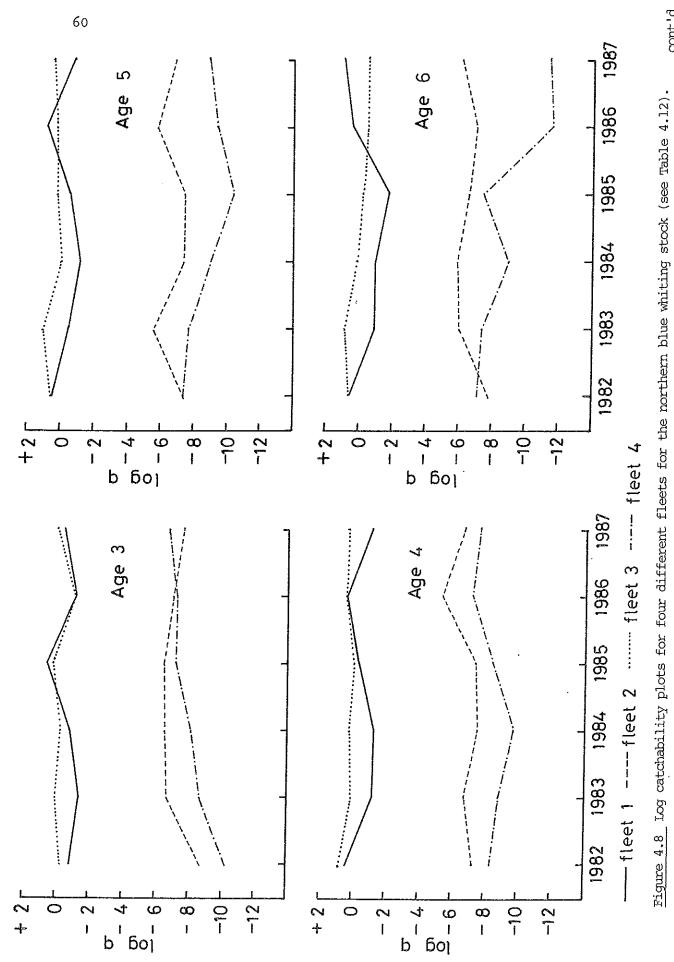


Figure 4.7 Total length and age composition (number of blue whiting from the USSR survey in the Norwegian Sea, summer 1988 (26 July - 19 August).





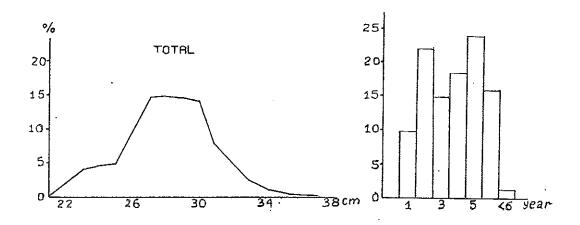


Figure 4.7 Total length and age composition (number of blue whiting from the USSR survey in the Norwegian Sea, summer 1988 (26 July - 19 August).



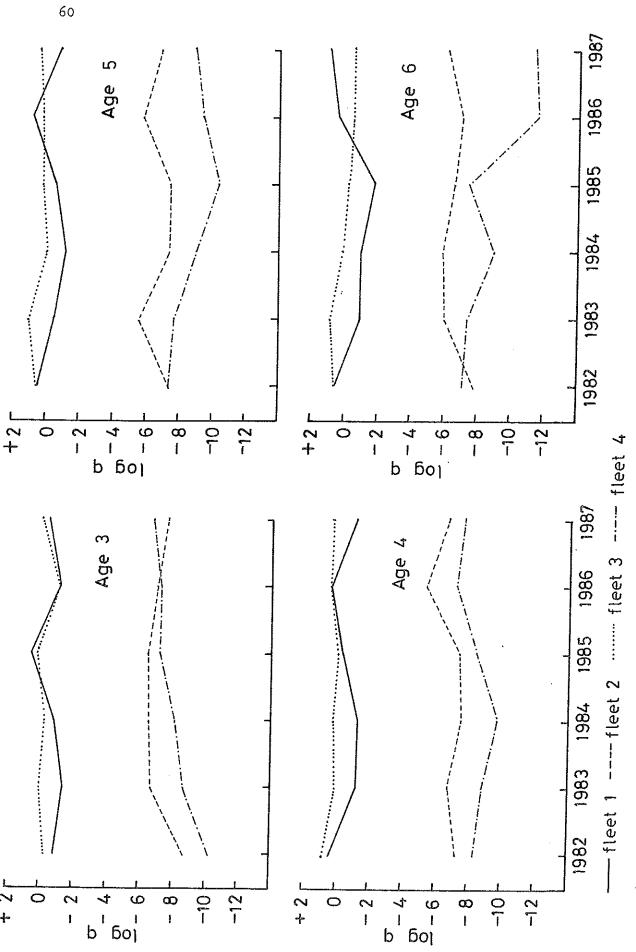
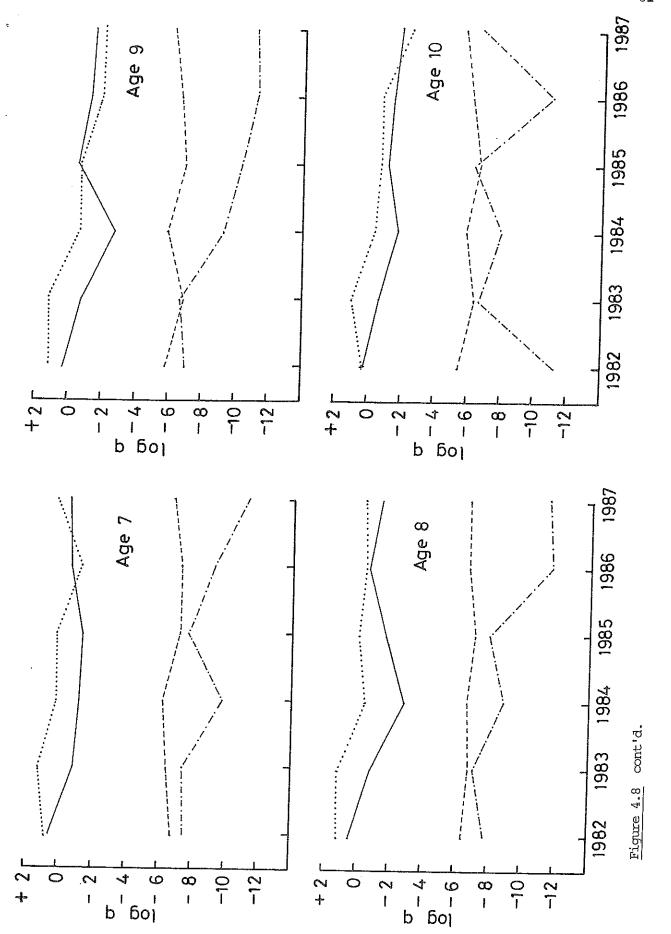
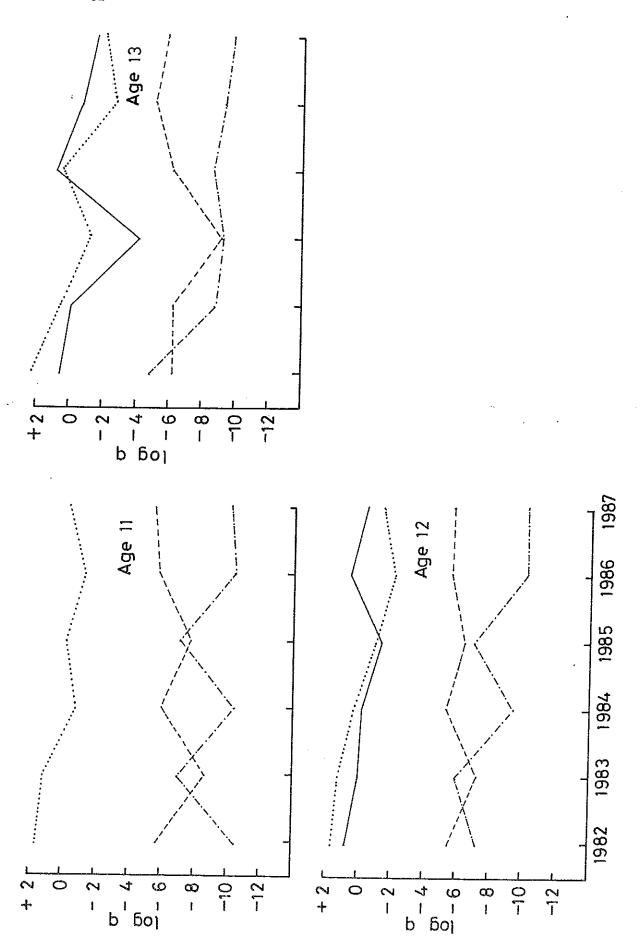
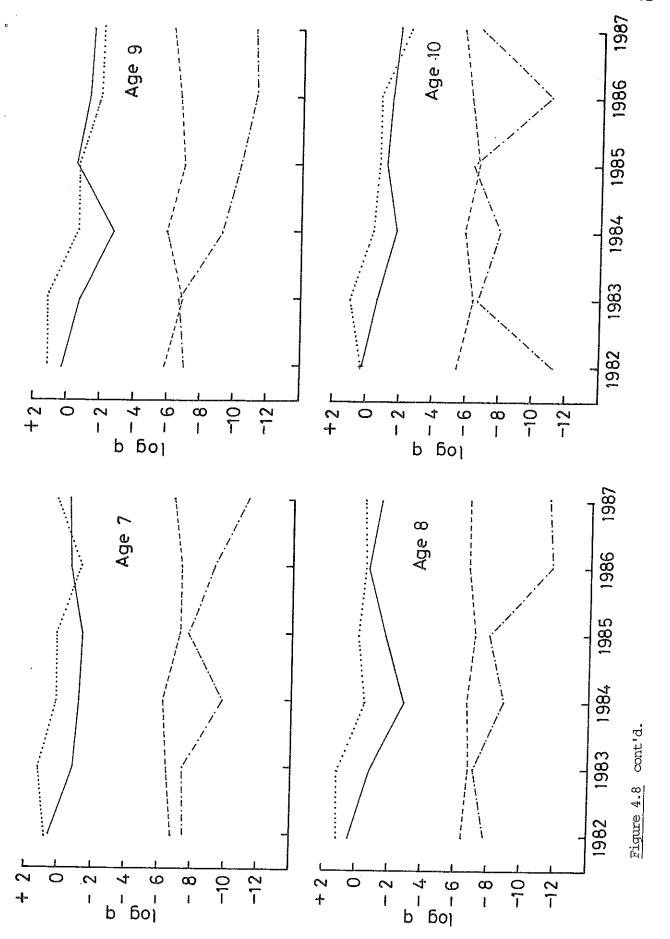


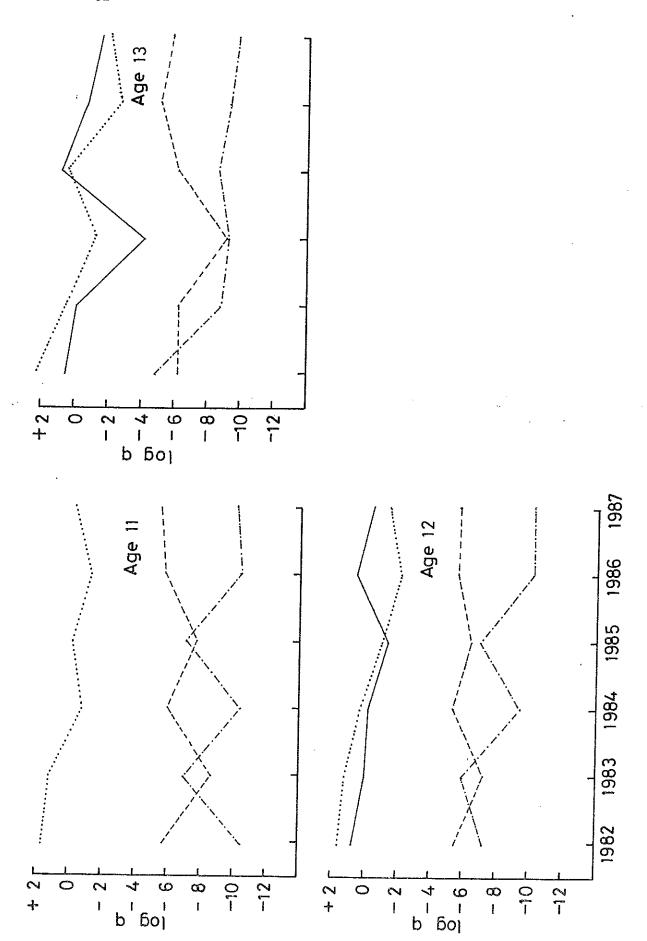
Figure 4.8 Log catchability plots for four different fleets for the northern blue whiting stock (see Table 4.12).





Figue 4.8 cont'd.





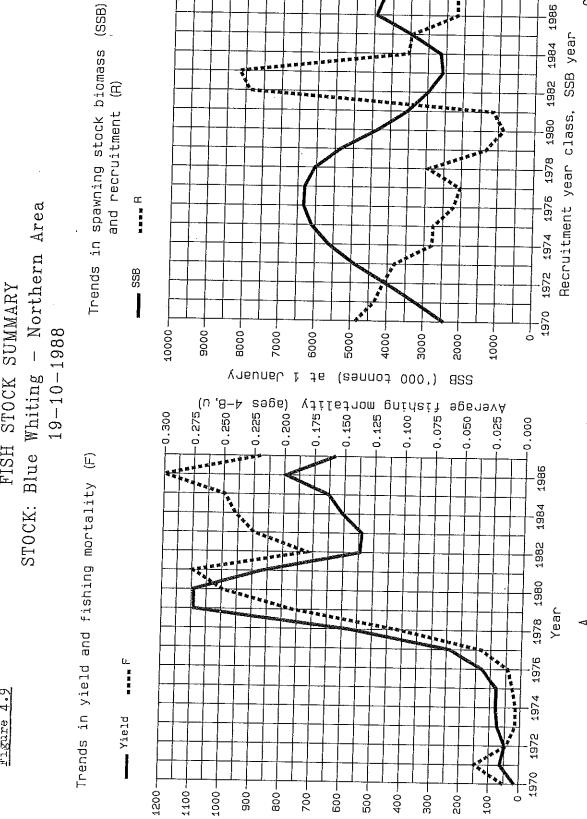
Figue 4.8 cont'd.

ctd.

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FISH STOCK SUMMARY STOCK: Blue Whiting Figure 4.9



Yield ('000 tonnes)

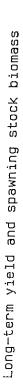
-45000 S) -40000 C) -35000 Mil

50000

.30000 -.0)

Figure 4.9 (ctd.)

STOCK: Blue Whiting - Northern Area FISH STOCK SUMMARY 19 - 10 - 1988



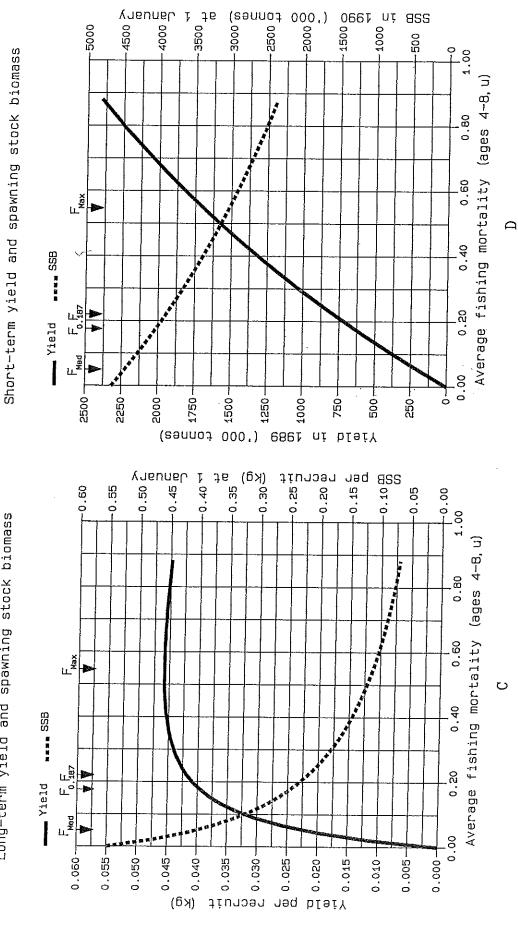


Figure 4.9 FISH STOCK SUMMARY STOCK SUMMARY STOCK: Blue Whiting - Northern A

STOCK: Blue Whiting - Northern Area 19-10-1988

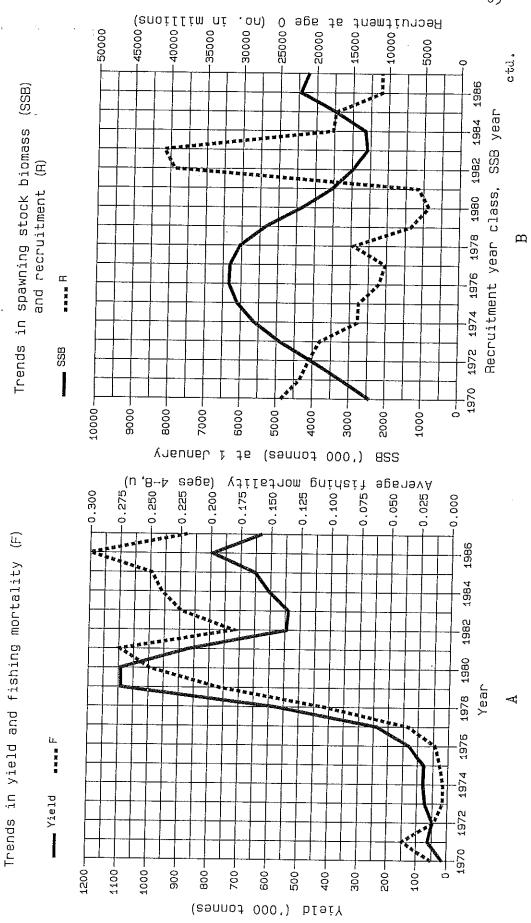
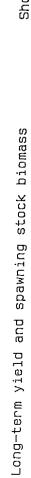
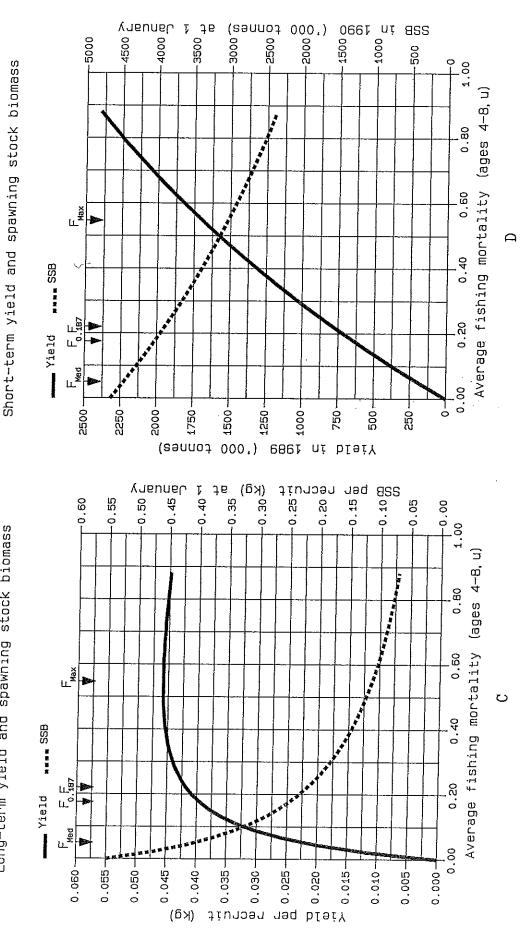
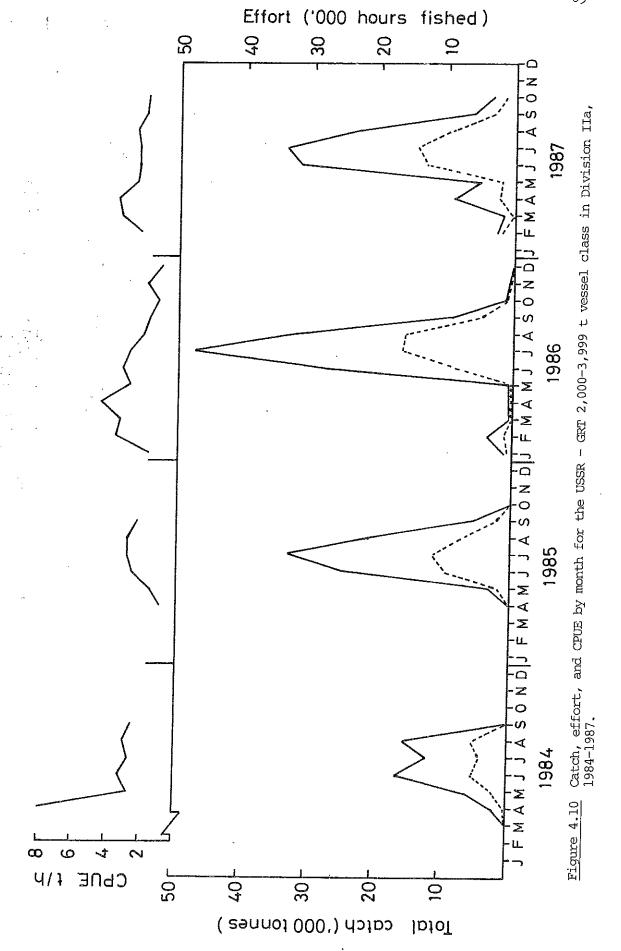


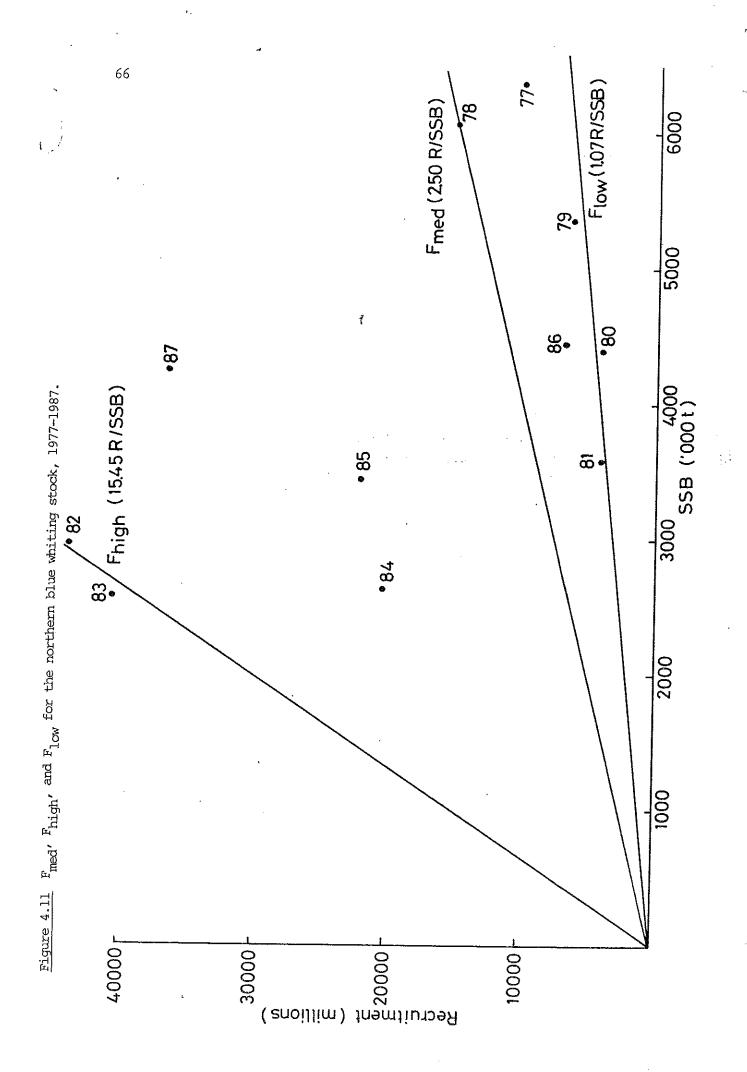
Figure 4.9 (ctd.)

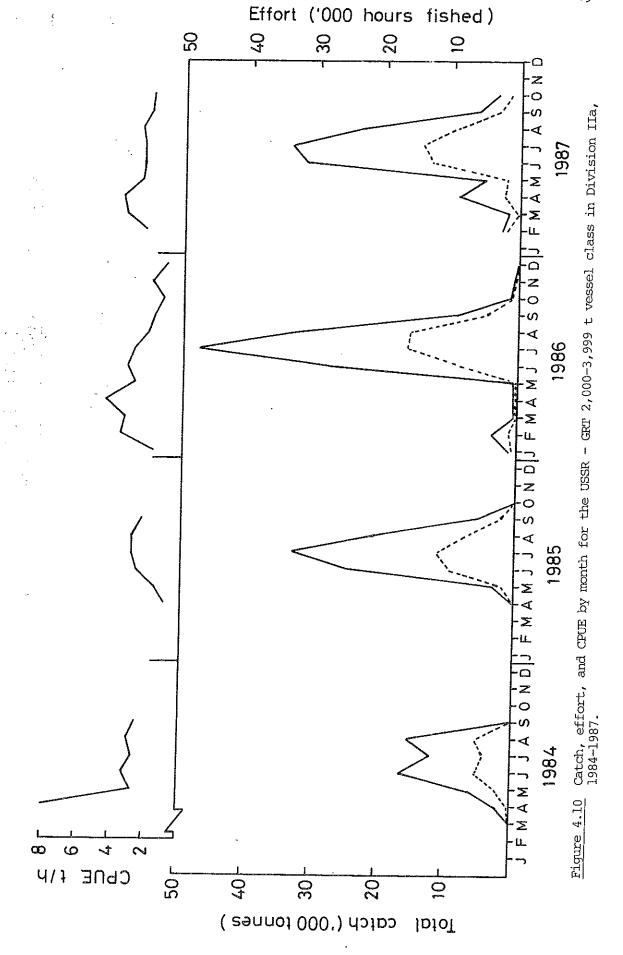
FISH STOCK SUMMARY
STOCK: Blue Whiting - Northern Area
19-10-1988











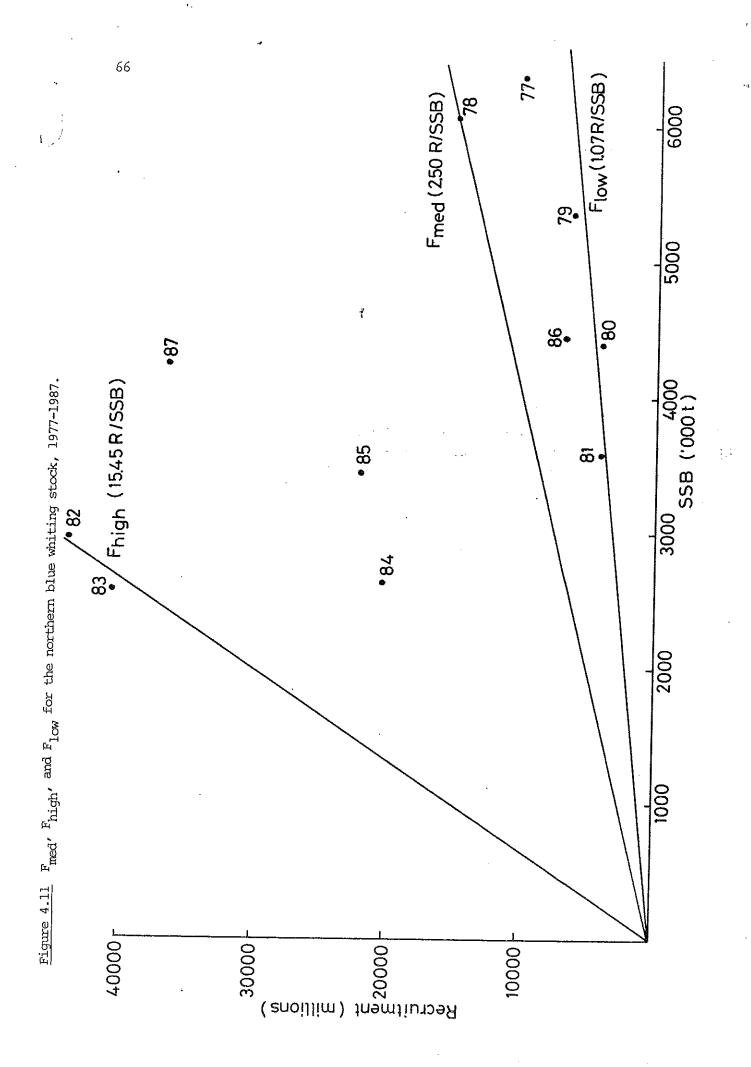
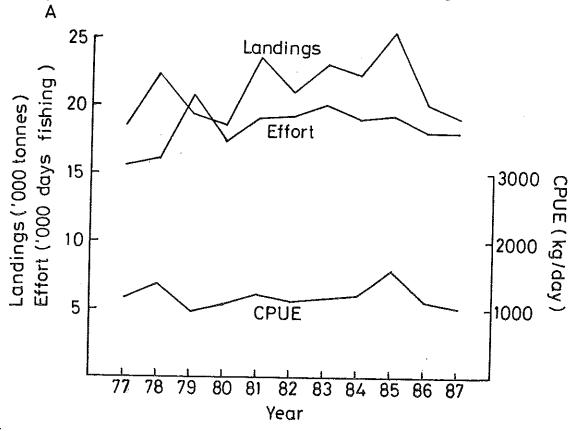
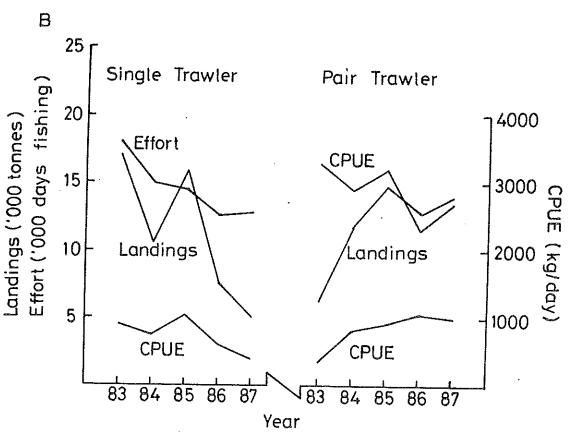


Figure 5.1 Catch, effort, and CPUE of Spanish trawlers for the southern area.

A: Total in the period 1977-1987

B: Split into single and pair trawlers in the period 1983-1987





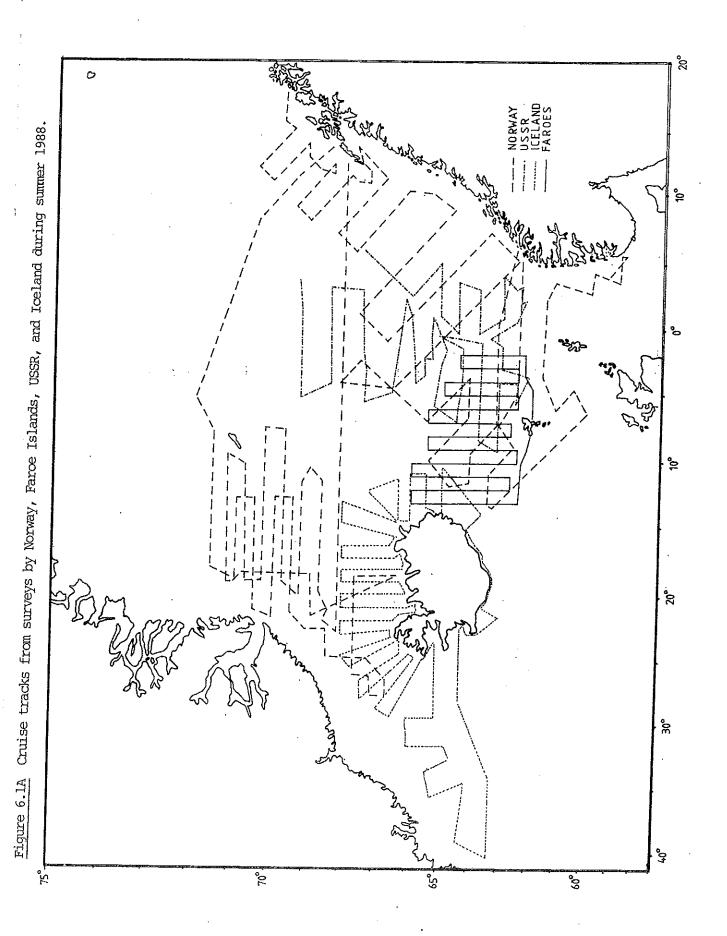
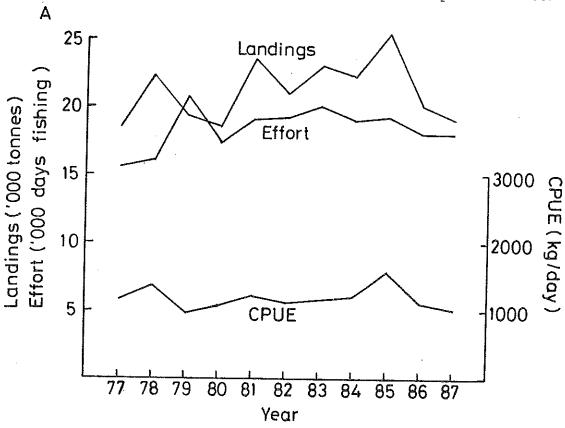
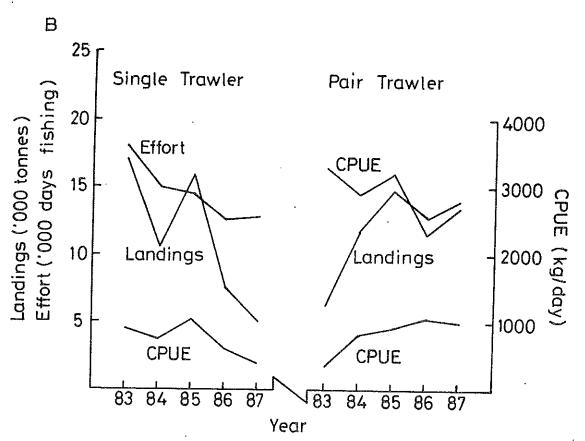


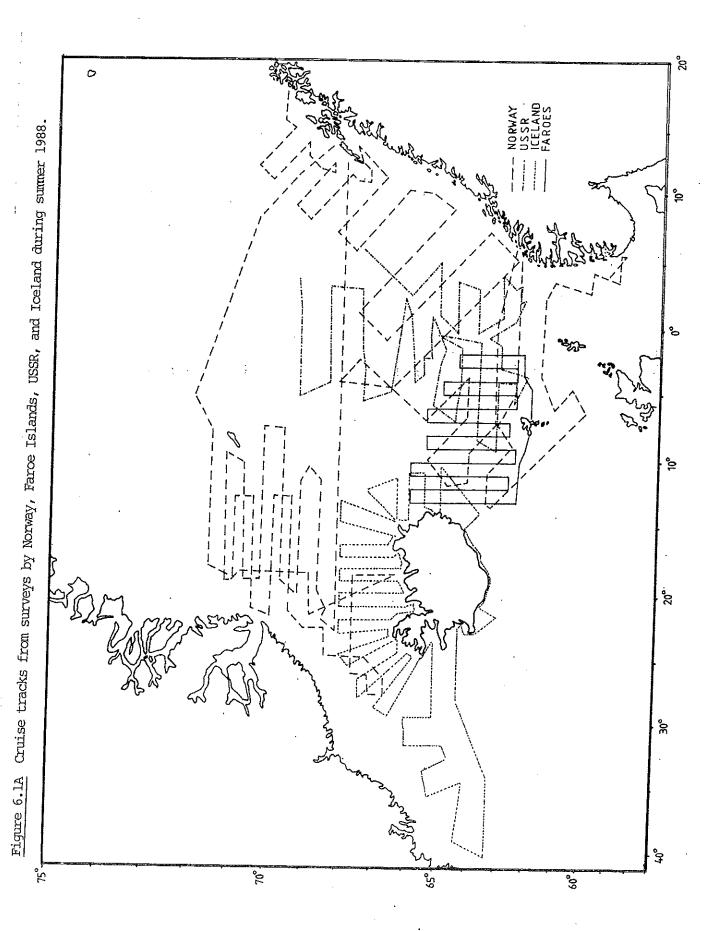
Figure 5.1 Catch, effort, and CPUE of Spanish trawlers for the southern area.

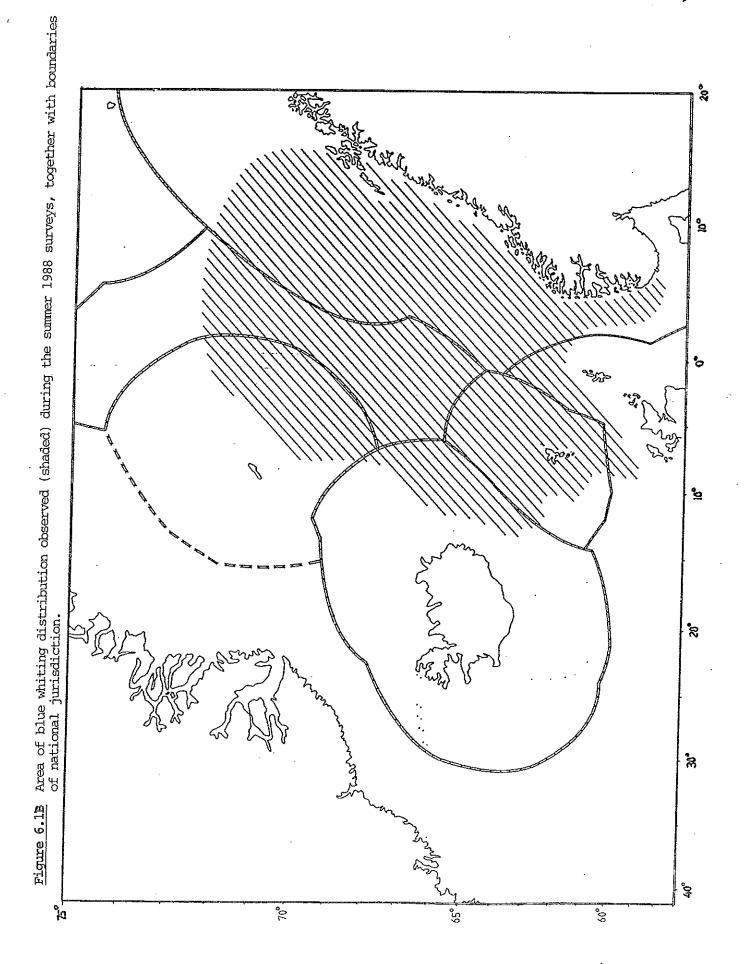
A: Total in the period 1977-1987

B: Split into single and pair trawlers in the period 1983-1987

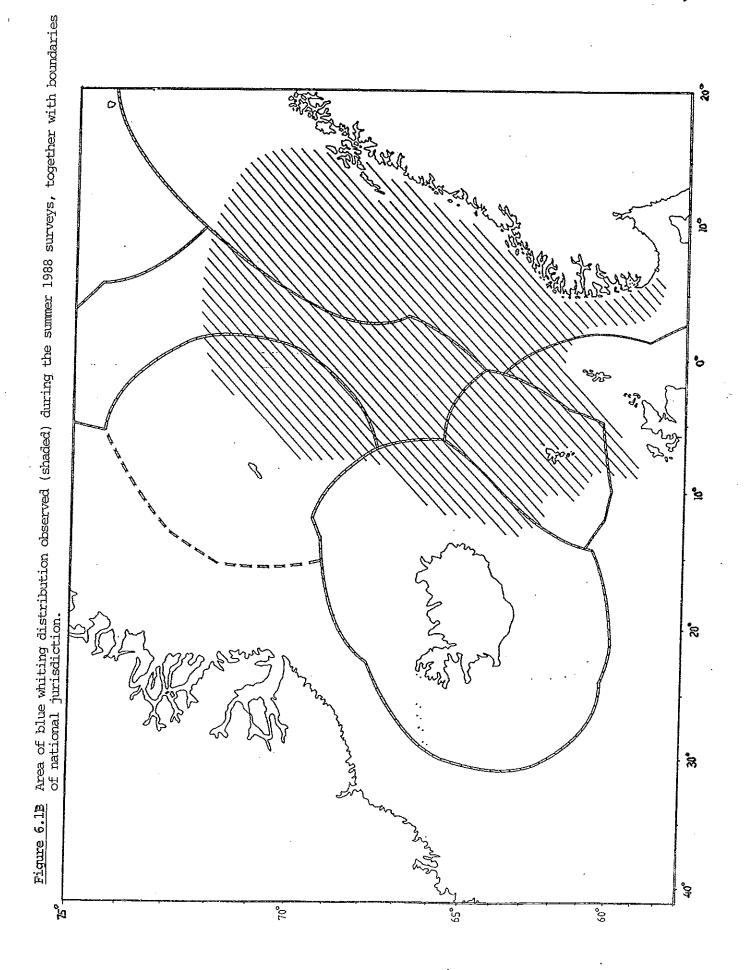








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